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TRANSPORT AND FATE OF NITROAROMATIC AND NITRAMINE EXPLOSIVES IN SOILS FROM OPEN BURNING/OPEN DETONATION OPERATIONS:

ANNISTON ARMY DEPOT (AAD)

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13. ABSTRACT (*Maximum 200 words*)
This report describes soil column experiments (task 1) used to study fate and transport of OB/OD residues within the upper 1 m of soil. [Terrestrial (task 2) and aqueous (task 3) toxicity studies are reported elsewhere.] Intact soil-cores were collected from Anniston Army Depot (AAD). Intact soil-cores were also collected from Radford Army Ammunition Plant (RAAP), Milan Army Ammunition Plant (MAAP), and Pueblo Army Depot (PAD); results of these three studies are reported elsewhere. Soil columns were housed in controlled-environment chambers, and each soil column was formulated to approximate the major OB/OD residues found at the respective sites. Synthetic rainwater was added to the columns twice weekly, and a controlled tension applied. Leachates were collected twice weekly. Columns were analyzed at 6.5-week intervals through 32.5 weeks. Columns were cut into 2.5-cm transverse sections, and subsamples were air-dried, ground, and extracted. Extracts and leachates were analyzed by HPLC for explosives to reveal fate and transport behavior.

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PREFACE

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TRANSPORT AND FATE OF NITROAROMATIC AND NITRAMINE EXPLOSIVES IN SOILS FROM OPEN BURNING/OPEN DETONATION OPERATIONS:

ANNISTON ARMY DEPOT (AAD)

1. INTRODUCTION

a. Out-of-date and out-of-specification munitions have commonly been disposed of by burning, or by detonation, on unprotected ground.[1] Through the promulgation of various environmental regulations, this practice has recently been limited. Burning pans and closed treatment systems have been used at various installations to mitigate environmental contamination. However, questions concerning the transport and transformation of open burning/open detonation (OB/OD) ash and waste explosives in soils and their environmental toxicity needed to be answered (AEHA, 1986).[2]

The standard practice of OB/OD of munitions historically involved quantities of explosives up to thirty tons per disposal event, and generated a mixture of contaminants into the immediate area at high concentration.[3] At many military installations OB/OD sites consist of multiple disposal areas. These OB/OD sites number in the hundreds, and have been developed and used by both the military and their civilian contractors during much of this century. Many of these sites have records inadequate to predict the nature and extent of the contamination. Residue from OB/OD contains both burned and unburned explosives, but environmental weathering and microbial action are known to produce modifications of these compounds.[4,5,6] Estimation of the environmental impact of OB/OD contamination at an individual site requires detailed knowledge of the type and amount of the chemical contaminants present and an understanding of their migration behavior within the soil.

The purpose of this project was to: 1) determine the transport and transformation of OB/OD contaminants in soil, 2) measure the toxicity of soils contaminated with explosives and 3) measure the toxicity of soil leachates. Three tasks were conducted to address the goals of the program. The first task used intact soil columns to measure the transport and transformation of chemicals in OB/OD ash and explosives of concern. The other two tasks involved determining the toxicity of explosives in soil to earthworms, and the toxicity of aqueous soil extracts to *Daphnia magna*.

In task one, intact soil cores were collected from Radford Army Ammunition Plant (RAAP), Virginia; Milan Army Ammunition Plant (MAAP), Tennessee; Pueblo Army Depot (PAD),

Colorado; and Anniston Army Depot (AAD), Alabama. The predominant explosives at each site were monitored in their respective soil-core columns for transport and transformation in the soil. Breakthrough and subsequent concentrations of the chemicals in the leachates collected from the columns were determined. Chemical transport and transformation experiments involved leaching soil columns with synthetic rainwater for up to 243 days. This report presents the data for Anniston Army Depot soils.

In task two, standard 14-day earthworm toxicity tests were conducted on OB/OD residues and specific explosives (results reported separately, in another technical report entitled **Toxicity of Selected Munitions and Munition-Contaminated Soil to the Earthworm *Eisenia foetida***).[7] In task 3, soil/water extracts were prepared, to partition water soluble biologically available components from the soil. These aqueous extracts were tested for toxicity to the aquatic organism *D. magna* (results reported separately, in another technical report entitled **Determination of Soil Toxicity to *Daphnia magna* Using an Adapted Toxicity Characteristic Leaching Procedure**).[8] The sensitivity of the *D. magna* method makes it a useful tool in assessing the impacts of contaminated soils. The results of this project will support site closure assessments at OB/OD sites, answer critical questions on the transport of explosives in soil, and address environmental toxicity data gaps.

In task one, intact soil-core columns were collected on-site to study the transport and transformation of munition residues in site-specific soils. Intact soil-core columns were collected rather than collecting bulk samples of soil for packed-column studies because soil physical and chemical characteristics are typically, sometimes dramatically, altered by the drying, sieving, and storing of soils necessary for preparing packed columns. Furthermore, such handling may also cause inappropriate and radical change in the ability of soil to degrade xenobiotics[9] or utilize naturally occurring compounds.[10] Intact soil cores offer the potential for a realistic view of site-specific soil conditions as they exist in the field, yet are portable so they may be studied closely in the laboratory under conditions that simulate those occurring in the field. If appropriate precautions are taken during the collection, transport, and study of intact soil cores, information obtained for site-specific soil conditions may also give added insight to the processes controling the transport and transformation of munition residues in soils. Many investigators acknowledge the advantages of using intact soil cores for study, but apply methods that require at least one transfer of the soil core from the collection probe to its destination column, potentially causing disruption of the soil core and alteration of its characteristics. However, a group of scientists[11,12] have developed a system for taking intact soil cores, and have applied

the system to the extent that it was accepted as a standard method for soil microcosm research by the U.S. Environmental Protection Agency[13] and the American Society for Testing and Materials.[14] The system used during the investigations detailed in this report is an adaptation of those soil microcosm methods, with various refinements to more realistically assess the transport and transformation of chemicals in soils.[15] The methods presented in the following section (II. Soil Methodology) describe these improved methods for 1) taking and directly delivering soil cores into their respective columns with minimal disturbance of the soil sample; and for 2) controlling environmental parameters of the soil cores during study including soil temperature and moisture regime, including quantity, quality, and intensity of simulated rainfall. These factors directly impact on the chemical, physical, and biological properties of the soil, and potentially affect the resulting transport and degradation of chemicals within soil[16] and their toxicity.[17]

AAD was selected as the fourth and final site for collection of samples, characterization, and investigation. AAD has open burning/open detonation (OB/OD) areas, and has detonated out-of-date and out-of-specification munitions containing cyclotrimethylenetrinitramine (RDX), 2,4,6,-trinitrotoluene (TNT), 2,4-dinitrotoluene (2,4-DNT), and 2,6-dinitrotoluene (2,6-DNT). Open detonation operations at AAD were carried out in shallow earthen depressions, covered with soil. The forces created by detonation of munitions typically disperse the resulting munition residues and soil in all directions. Thus contamination of soil due to OB/OD operations by detonation occurs both in the immediate area of detonation, and in the surrounding area.

2. SOIL METHODOLOGY

a. Collection of Intact Soil Cores

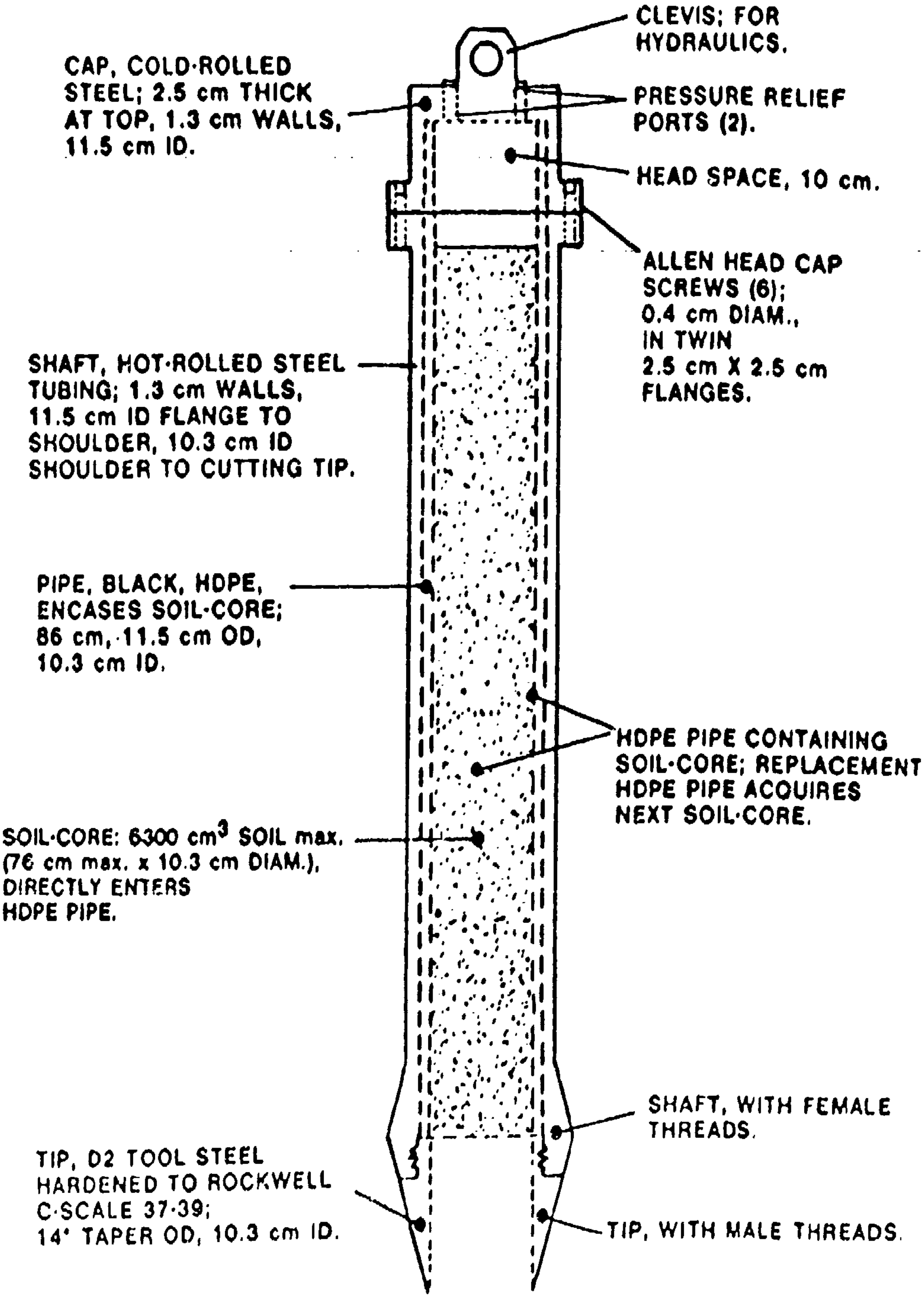
Prior to initiating collection of soil cores, a visual inspection of the OB/OD site was performed to ensure that the soil types conformed to those specified in the soil survey maps, obtained from the U.S. Soil Conservation Service.[18] Next a site of the same soil type and characteristic as that of the OB/OD area was located. In order to be selected, a site must be free from contamination by munition residues, preferably undisturbed, and have an area large enough that sampling near soil-type transition areas or obvious physical discontinuities was avoided.

In the field prior to sampling on-site, the soil was brought to field moisture capacity. Watering of the soil was initiated at least 24h before sampling to ensure sufficient time for both wetting, and drainage of excess water. A sampling grid was then layed out at the site selected so soil-cores would be taken every 4 feet, on center. This was done to ensure that there was sufficient work area around each sampling location to prevent compaction of adjacent locations during sampling. Each site was measured and sampling locations were marked with flags. Native vegetation (primarily grasses) were cut at the soil surface and the aerial portions of the cut plants were removed prior to sampling the soil.

The probe (Fig. 2.1) was lifted into the air and moved to each sampling location using the front-end loader and a chain. An aluminum stop-plate, 18" x 18" x 0.5" (45 cm x 45 cm x 1.3 cm) with a central hole for locating the probe, was placed over the sampling location prior to pushing the probe into the soil. The stop-plate allowed more uniform samples to be taken. A total of thirty soil-core samples were taken per site to ensure an excess of available columns[19] from which to initially test and ultimately select the final twelve columns per study. The soil probe was pushed rather than pounded into the soil to alleviate zonal compaction and minimize disruption of the soil being taken.[20] To prevent distubance of the soil at adjacent sampling locations, the front-end loader was brought in perpendicular to the area in its approach to the first sampling location; after the sample was taken, the loader was backed out, moved to the right, again moved in perpendicular to the next sampling location; and this process continued until sufficient soil-core columns had been collected.

For the soil that entered the probe during collection of intact cores, the maximum clearance discrepancy allowed (using the tolerances specified, Fig. 2.1) during delivery of soil into the high density polyethylene (HDPE) pipe

FIGURE 2.1 CROSS-SECTION OF SOIL SAMPLING PROBE WITH SOIL-CORE ENCASED IN HDPE.



inside the probe was <0.05-cm, resulting in a soil-core diameter of 10.3-cm $\pm$<0.1. The HDPE pipe used in this study was opaque, the grade and quality used in high pressure gas pipelines. HDPE pipe was purchased in 12.2-m (40-ft) lengths, and prior to going to the field was cut and sanded to the specified dimensions. The HDPE pipe collection tubes were inert hydrophobic barriers that remained an integral part of the soil-core columns. Thus disruption of the soil due to column-to-column transfers was eliminated. Upon removal of the HDPE collection tube containing the soil-core from the probe, measurements were taken of the resulting head space within each column; additionlly it was advantageous to measure the depth of soil penetration by the probe that results from sampling. If dramatic inconsistencies occurred in the depth values in the field, the corresponding columns were rejected and others taken in their place. After removal from the probe, each HDPE collection tube containing a soil core was immediately placed in a set of "V" blocks for sealing and packaging. Each end of the HDPE collection tube was sealed with a barrier-cap consisting of double layers of 4-mil thick polyethylene sheeting, then sealed with duct tape to the HDPE pipe. This minimized gas exchange and prevented moisture loss from the soil cores. A sufficient supply of barrier-caps were prefabricated in the laboratory, prior to going to the sampling site, in order to decrease the amount of field time required to seal a soil-core sample tube. Barrier-caps were prefabricated by cutting out a 10" square piece of double-layered (2 x 4-mil) polyethylene sheeting, centering the square over an empty HDPE collection tube, and wrapping it around while pushing it down over the tube. This wrap was then held in place by a thick rubber band so a piece of duct tape could be placed tightly around the wrap 1" (2.5 cm) from the end of the HDPE collection tube. The corners of the square wrap (excess) were then cut off around the tube 2" (5.0 cm) below the tape. When using these barrier-caps in the field, the barrier-cap is slipped ontc the end of the HDPE collection tube and an additional piece of duct tape is used to completely seal the edge of each barrier-cap to the outer surface of the tube. After the ends were sealed, each tube was labeled with the date, location, and collection site number.

Collected soil cores in their HDPE tubes were placed into 32-gal (120-L) opaque polyethylene containers, which contained a 6" (15 cm) thick foam rubber pad in the bottom. A group of HDPE tubes were placed on the pad in each container with the soil end down. The sealed columns extended out of the top of the containers, and through the container covers which had been cut to fit the columns. Black polyethylene plastic bags were used to cover the tops of the sealed columns. All soil samples obtained from a site were transported back to the laboratory upright in padded containers to minimize disruption of the soil cores during transport.

b. Soil Column Preparation and Testing

Afterward in the laboratory, selected soil-core columns were trimmed of excess soil if any was present, fitted with a porous ceramic disk (2.5 um pores) in opaque HDPE endcaps containing fittings for teflon tubing with in-line monitoring and shut-off valves (Fig. 2.2). The HDPE end-caps used in this study were the grade and quality used in high pressure gas pipelines, however prior to use each was milled to contain a well for the controlled-pore ceramic plate, then milled again and threaded for tubing fittings. End-cap fittings were also HDPE. The intact soil-core columns were then transferred into the controlled temperature (controlled environment soil-core microcosm unit; CESMU) chamber (Fig. 2.3). The CESMU chamber was housed in a greenhouse for high-temperature control, and was equipped with 10.5 MJ h^{-1} cooling capacity sufficient for maintaining a constant temperature within entire soil columns for isothermic studies at 25.0 $\pm$0.1 ^{o}C. During these investigations the tops of the columns were left open to receive sunlight, sufficient for plant growth (however, they could instead be covered with an opaque insulated cover spanning all columns to eliminate photodegradation processes). Controlled tension (vacuum) was applied equally at the bottom of each soil column across the controlled-pore ceramic plate, at 30-35 kPa; tension was regulated and monitored.

The tension that was applied is comparable to that encountered in the field as a result of combined soil matric and gravitational forces; thus avoided were undue flooding, the buildup of a hanging column of water in the lower portion of columns, and artificial changes in soil redox potential in response to steady-state alteration of the soil water content, as can happen when gravitational forces alone are relied upon to promote water flow through soil columns. Before initiating any studies of the fate, migration, and degradation of munition residues, the soil-core columns in the CESMU chamber were saturated with water and equilibrated under tension (48h minimum), after which water thru-put was evaluated for each of the initially selected columns.

The initial selection of twelve columns per soil type (site) for preliminary testing was done on the basis of similarity of head space within columns, an easily obtained measurement that is the compliment to column length. Using the sampling methods and measurements described above, a group of columns differing in length by only centimeters (Fig. 2.4) was obtained that provided a sufficient number of columns from which to select those for the preliminary testing of water flow (thru-put). Within each type of soil sampled, soil-core columns were initially selected on the basis of similarity of length; and replacement columns within each soil type group, if needed, were those with the next closest to the mean length. For the

FIGURE 2.2 SOIL-CORE COLUMN INCLUDING END-CAP AND FITTINGS.

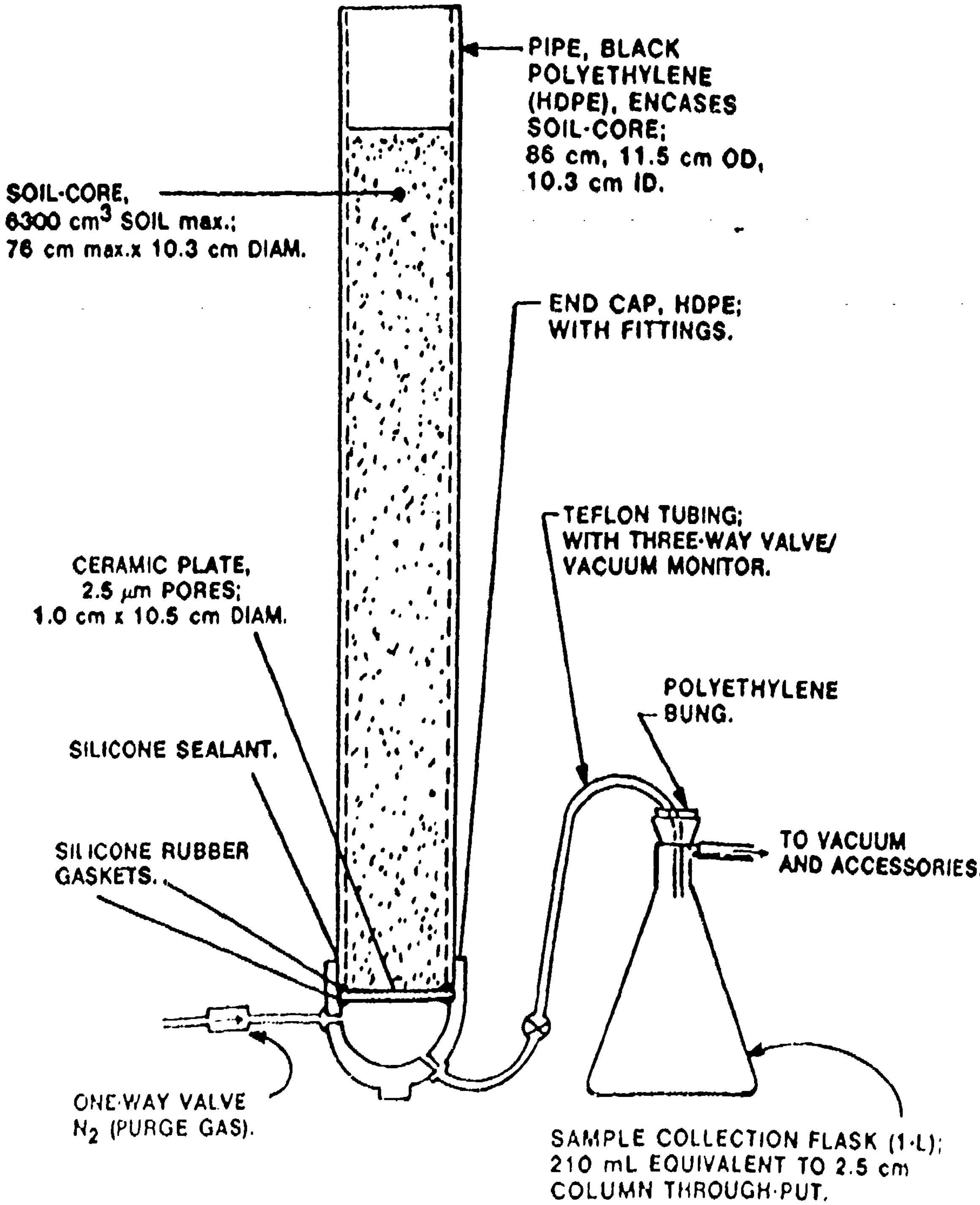


FIGURE 2.3 CROSS-SECTION OF CESMU SYSTEM SHOWING ONE SOIL-CORE COLUMN AND VACUUM SYSTEM.

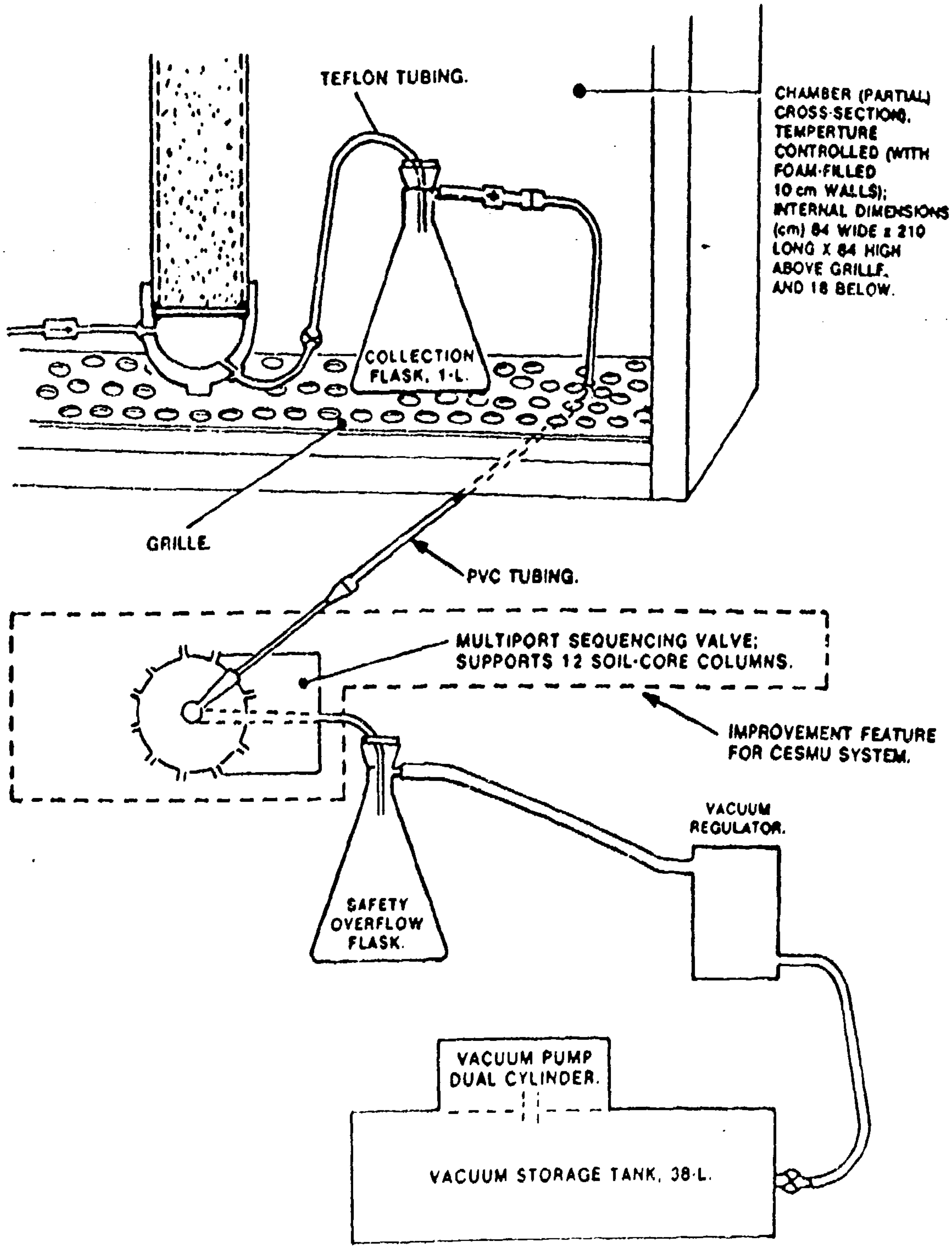
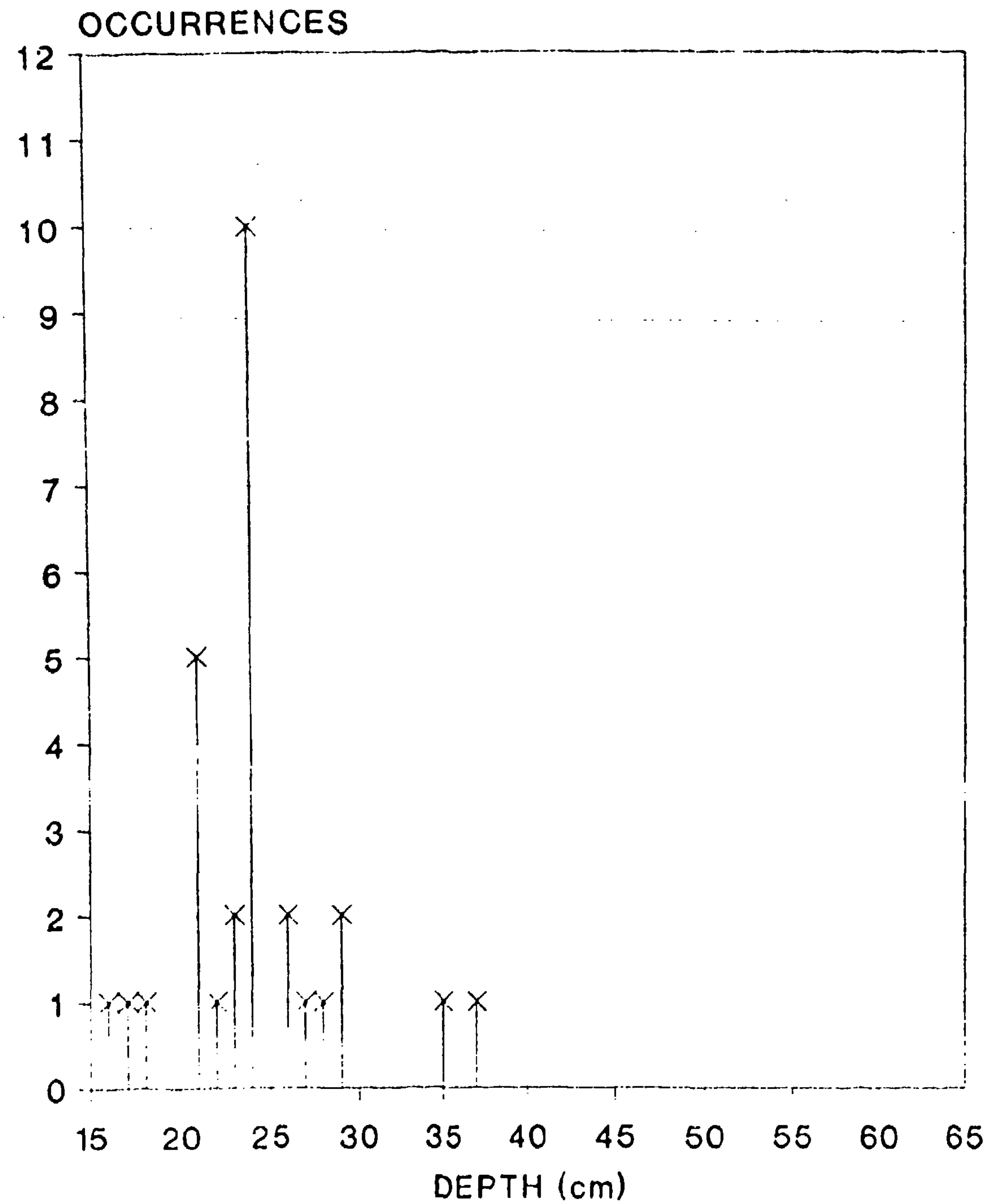


FIGURE 2.4 FREQUENCIES OF SOIL-CORE COLUMN DEPTHS: CLARKSVILLE-FULLERTON STONY/CHERTY LOAM SOIL (AAD).



initially selected columns that were found to have rates of flow or water thru-put substantially different than the median, replacement columns were selected, and then similarly evaluated. Outlier-columns within each soil type (based on values of water thru-put, when water was applied, monitored, and sampled analogous to artificial rain additions described below) were replaced until the standard deviation about the mean value for water thru-put was $\leq$10%. Then, based on the adjusted mean excluding outliers, any additional columns with thru-put values falling outside of the adjusted mean $\pm$original standard deviation were also replaced, until all test columns fell within one standard deviation of the mean. Representative columns were thus identified and retained for study in the CESMU chamber.

c. Spiking of Soil Columns

OB/OD contaminated soil was collected from an open detonation pit that had the most recent disposal operation. This contaminated AAD soil was air-dried, extraneous materials (nails, stones, etc.) removed, crushed, and ground to pass a 2-mm nylon seive. After this, the type and quantity of munition residues was determined. Then a mixture of the prepared detonation pit soil and explosives, related to munition residues detected in the screening analysis, was prepared. After twelve representative soil columns collected from the site were identified and randomly placed in the CESMU according to the specifications in this report, the soil and explosives mixture (spike) was added atop the soil surface of the randomly assigned treatment columns. During preparation of the mixture 1000 mg kg^{-1} (ppm) each of TNT and 2,4-DNT, and 400 mg kg^{-1} 2,6-DNT were incorporated into the spike. Each of ten treatment soil columns from the AAD site received a mass of spike equivalent to 1" (2.5 cm) of the spiked soil mixture (yielding approximately 210 mL of the mixture, after settling), while the two control columns received a mass of uncontaminated soil from the site equivalent to 1" (2.5 cm) of the uncontaminated native soil.

d. Simulated Rainfall and Resulting Leachates

In the laboratory, synthetic rainwater was formulated based on records of the constituents of rainfall across Pennsylvania,[21,22,23] and used to represent the constituents and characteristics of rainfall in the mid-Atlantic coastal region. The constituents of the synthetic rainwater were (*uM*, in deionized water) 15 SO_4, 11 NO_3, 9 Cl, 25 NH_4, 7 Ca, 3 Mg, 3 Na, and 2 K; pH was adjusted to 4.60 $\pm$0.02 using a 1.35:1 mixture of 1*M* H_2SO_4 and 1*M* HNO_3. Synthetic rainwater in the amount of 0.2" (0.6 cm) was administered at the top to the center of each soil-core column twice a week at the rate of 1" h^{-1} (7 um s^{-1}) using a peristaltic pump.[15] Resulting leachates were

collected into vacuum flasks and kept at soil column temperature (25.0 °C). Leachates were harvested twice-weekly, and analyzed for munition residues and transformation products; the pH of leachates was determined at the time of collection using a combination pH electrode and digital pH multimeter. The maximum duration of leaching was 32.5 weeks.

The analytical methods and procedures for determining munition residue concentrations in leachates were the same as described in Section 3 of this report, with the following exceptions:

Very low concentrations of amino-DNTs were encountered in the AAD leachates. The amino-DNT analytes suffer from peak broadening with the isocratic HPLC procedure, causing a decrease in analytical sensitivity. In order to correct this problem, a gradient of 1-10% acetonitrile was added to the HPLC mobile phase This gradient was incorporated at 11 min., and reached 10% at 22 min.

Criteria of detection values for leachate samples for each explosive and their transformation products, including details of calculation, are given in Appendix B.

e. Harvest of Soil Columns

Replicate soil columns were harvested at regular intervals following leaching, sealed (in the same manner as when collected from the field, Section 2.b), then frozen. Afterward, the frozen soil cores encased in HDPE pipe were carefully cut open using a router (with the depth of penetration set to the wall thickness of the HDPE tubes) and a hand guide, allowing the resulting intact soil core to rest in the lower half of the HDPE pipe. Soil cores were then slowly thawed in the horizontal position to effectively eliminate longitudinal migration. Then from top to bottom, the soil cores were marked into sections using a spatula to indicate 1" (2.5 cm) depth intervals. The soil was then sectioned into 1" depth x 4" diam. (2.5 cm x 10.3 cm) discs. Each disc was individually transferred into a clean polyethylene bag, air-dried, crushed, and ground to silt consistency ($\leq$150 um). Using similar sectioning methods but larger section sizes, replicate bulk density determinations were done individually for A and B horizons using the extra soil-core columns.

Two of the soil-core treatment columns were randomly selected and harvested after each designated leaching interval. Harvesting of columns occurred after 6.5, 13, 19.5, 26, and 32.5 weeks of leaching, for a total harvest of ten treatment columns. The two control columns were harvested after 32.5 weeks of leaching, along with the final treatment columns.

The analytical methods and procedures for

determining munition residue concentrations in AAD soils were the same as described in Section 3 of this report, with the following exceptions:

Corrections due to the loss of the internal standard DNB were appreciable only for analyses of AAD soils. Recovery of DNB, a nitroaromatic, ranged around 50%. Uncorrected recoveries of the other nitroaromatics (e.g. TNT, TNB, and DNTs) from AAD treatment soil samples were also poor; but uncorrected recoveries of the nitramines (e.g. RDX and HMX) were good. Therefore for the AAD soil samples, recoveries of the nitramines were not corrected for losses of DNB internal standard.

Criteria of detection values for soil samples for each explosive and their transformation products, including details of calculation, are given in Appendix B.

f. CESMU System Integrity

Although controlled tension was applied equally at the bottom of each soil-core column during studies and was regulated and monitored, the failure to maintain tension at any single column potentially affected the tension on the remaining columns until the failing column was repaired or eliminated. Generally this problem occurred only during the set-up and preliminary testing of columns, and resulted from an immediately repairable minor leakage. Infrequently this problem occurred due to handling of system components during sampling of leachates, but again caused only minor leakage of vacuum and was easily and immediately repairable.

Physical and mechanical systems supporting the CESMU chamber and rainfall delivery functioned well under almost constant use for more than two years. Over this period, the transport and transformation of munition residues were investigatied in four different site-specific soils, using twelve study columns per soil type (site), with individual studies lasting from six to nine months depending upon the lability of chemicals investigated. During these studies only one study-column failed out of fourty-eight total columns selected for investigation, and the remaining soil columns had relatively constant outputs within respective soil types.

Mechanical-part failures during this period included only one vacuum pump failure (replaced with a back-up unit while the original was rebuilt), and one vacuum regulator that failed inspection during an investigation and was immediately replaced with a back-up unit. Performance of the physical and mechanical systems was high, providing high confidence in maintenance of the conditions and limits designed for the studies.

g. Determination of Selected Soil Parameters

For this investigation several soil physical and chemical parameters were selected for determination by the University of Maryland Soil and Plant Testing Laboratory, College Park, MD. The soil properties chosen were selected to more fully characterize and understand the role of the effects of specific soil properties on the transport and transformation of munition residues, and their transformation products. Soil properties determined included percent sand, silt, clay, and organic matter, the cation exchange capacity (CEC), and soil pH.

3. DETERMINING MUNITION RESIDUES AND THEIR TRANSFORMATION PRODUCTS

a. Analytical Methods Development Using High Performance Liquid Chromatography (HPLC)

The quality control program for this study was based on a system that assessed sample preparation, analyte recovery, and analytical precision and accuracy. Details of this program are presented in Appendix A.

Our approach to analytical determinations supporting these investigations was based on a two step process. The first step was qualitative analysis of contaminated surface samples to screen for compounds present in environmentally significant concentrations. Due to the variety of military explosives and their environmentally modified forms, a new method was required to chromatographically isolate and thus identify the majority of the compounds likely to be encountered. The second step was quantitation of these contaminants in soil and in water that leached through this soil. Screening and quantitation processes required different HPLC methods because quantitation required greater analytical sensitivity than the screening method could provide.

Sample preparation and extraction procedures were adapted from a method developed and extensively tested by Jenkins[24,25,26]. These modified procedures entailed grinding air-dried soil samples, and extracting into acetonitrile with 18 hours of sonication at 20°C. Extracts were then centrifuged at 3900 X G for 15 min, and analyzed by HPLC. The latter portion of the sequence differs from Jenkin's method in that a step requiring mixing the acetonitrile extract with an aqueous floculating solution was eliminated, and that the internal standard 1,3-dinitrobenzene (DNB) was incorporated.

An estimation of the efficiency of extraction of each compound was obtained by doping subsamples of uncontaminated surface soil with acetonitrile containing a mixture of selected OB/OD compounds plus DNB. The soil was air-dried and extracted as above, and the efficiency of extraction was calculated from the amount of each compound recovered. Because the efficiency of extraction of the OB/OD components at our test sites was similar to that of DNB, a simplified recovery correction system was possible. All soil samples were extracted with acetonitrile containing 2.5 mg L^{-1} (ppm) of DNB as an internal standard. Observed concentrations of OB/OD components in the extraction mixture were corrected for losses of internal standard that occurred during the extraction process. Corrections were also made for any increases in concentration due to evaporation of the extraction solvent.

Aqueous leachates were directly analyzed for

munition residues and degradation products. These determinations were done without any preconcentration, internal standardization, or other preparation.

HPLC analyses of leachates and soil extracts were done using a Hewlett-Packard (HP) 1050 HPLC system that consisted of an autoinjector, pumping module, and UV detector. Signal integration was performed with an HP 3396A integrator. All analyses except screening tests for the presence of NG were done by UV absorbance at 244 *nm*. NG was determined at 220 *nm*.

Extracts of uncontaminated soils (background) and highly contaminated surface soils were screened by the gradient method developed for this investigation. A 15-*u*L sample was injected onto a 4.6 X 250 mm Rainin Microsorb C18 column with a 5 *um* particle size, in series with a 4.6 X 250 mm Supelcosil LC-PAH column. Elution was accomplished with a methanol:water gradient (Table 3.1).

A simpler isocratic method (developed elsewhere by Miyares and Jenkins[27]) was used to substantiate identification and to quantitate contaminants. This isocratic method entailed isocratic pumping of a mobile phase of 70.7% water, 27.8% methanol, and 1.5% tetrahydrofuran, at a flow rate of 2 mL min^{-1}

Table 3.1 HPLC Time/Gradient (Methanol:Water Mixture) for Initial Screening of Samples for a Broad Range of Munition-Related Analytes and PAHs.

Time (min)	Percent Methanol (% MeOH)
0	30
1.5	33.5
6.0	47.5
24.0	51.0
35.0	54.5
60.0	100.0
80.0	100.0

through a 25 cm x 4.6 mm Supelco LC8 column of 5 *um* particle

size. This procedure was modified by the addition of an acetonitrile gradient to minimize peak-broadening when amino-dinitrotoluenes (amino-DNTs) were quantitated.

b. Results of HPLC Methods Development

The above procedures have proven effective in recovering and quantitating OB/OD residues in all soils tested (Table 3.2); they have the additional advantage of being simple and reproducible. However, several shortcomings were encountered. Efforts to identify some minor components of the OB/OD soil contaminant mixture were not successful due to interferences from natural soil components. Although the majority of UV-absorbing soil components elute from reverse phase chromatography before most explosives, some elute at later retention times causing a rough baseline at high sensitivities thereby making quantitation of extremely small peaks unreliable.

Table 3.2 Efficiencies of Recovery of Selected Munitions, from Soil and Water.

	Percent Munition Recovered (%), ±s		
	From soil extracted with acetonitrile		From aqueous leachate concentrates in MeOH
Compound	doped uncontam.	doped contam.	
RDX	95 ± 1	91 ± 2	38 ± 1
HMX	99 ± 6	112 ± 4	29 ±10
TNT	107 ± 1	94 ± 9	90 ± 4
2,4-DNT	103 ± 1	110 ± 5	108 ± 7
2,6-DNT	103 ± 1	103 ± 2	104 ±20
2-Amino-DNT	100 ±<1	103 ± 1	112 ±15
4-Amino-DNT	98 ± 3	102 ± 4	137 ±40
TNB	102 + 2	114 ± 3	123 ± 3

The gradient procedure presented here effectively separated components of a mixture that included most compounds likely to be encountered during analysis of soils from OB/OD contaminated sites (Fig. 3.1). It was able to detect many

1 Nitroguanidine (NQ)
2 2,4,6-Trinitrophenol (Picric acid)
3 1-Acetyloctahydro-3,5,7-trinitro-1,3,5,7-tetrazocine (SEX)
4 Cyclotetramethylenetetranitramine (HMX)
5 1-Acetylhexahydro-3,5-dinitro-1,3,5-triazine (TAX)
6 Cyclotrimethylenetrinitramine (RDX)
7 1,3,5-Trinitrobenzene (TNB)
8 1,3-Dinitrobenzene (DNB)
9 2,4,6-Trinitrophenylmethylnitramine (Tetryl)
0 2,4,6-Trinitrotoluene (TNT)
1 4-Amino-2,6-dinitrotoluene (4-Amino-DNT)
2 2-Amino-4,6-dinitrotoluene (2-Amino-DNT)

13 2,6-Dinitrotoluene (2,6-DNT)
14 2,4-Dinitrotoluene (2,4-DNT)
15 Naphthalene
16 Acenaphthylene
17 Fluorene
18 Phenanthrene
19 Anthracene
20 Fluoranthrene
21 Pyrene
22 Benz(a)anthracene
23 Chrysene
24 Benzo(a)pyrene

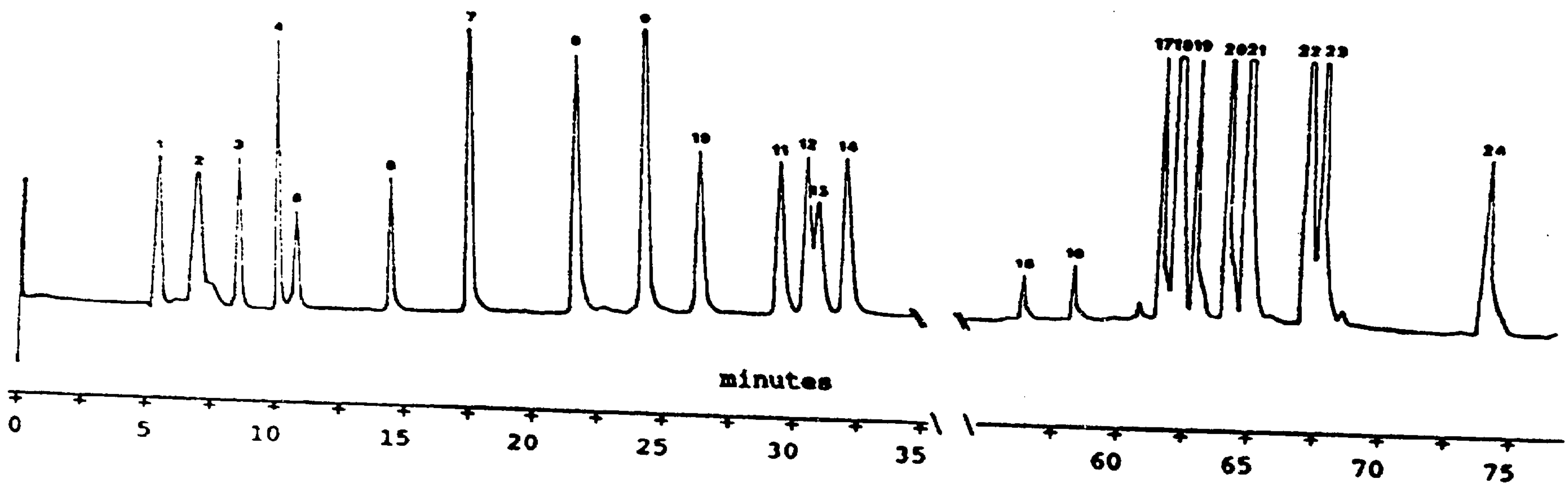


Figure 3.1 HPLC chromatogram showing the separation of a series of munition residues, environmental degradation products of explosives, and PAHs, using the gradient chromatographic (screening) method.

compounds that would otherwise be missed by previous methods, and produced sharp symmetrical elution peaks for all compounds tested. However this chromatography required 90 min to complete, and could not be used as a routine procedure at high sensitivity (compounds <1 mg L^{-1}) because of problems with baseline drift. The isocratic HPLC method of Miyares and Jenkins proved effective in quantitating intact RDX, TNT, and DNTs (2,4-, and 2,6-dinitrotoluene) in water, acetonitrile, and methanol but performed less well with the aminodinitrotoluenes because they were later eluting and exhibited significant peak broadening (Fig. 3.2). Peak broadening caused problems with quantitation because it caused erratic start times during electronic integration of peak areas. We also observed that this solvent and column combination was unusually sensitive to temperature. At room temperatures the large negative absorbance peak from acetonitrile interfered with the quantitation of HMX. At temperatures above 23°C retention times were shortened, and at 30°C the system no longer resolved the two aminodinitrotoluenes.

Recovery of explosives doped into uncontaminated soil were nearly quantitative (Table 3.2); adjustments of recoveries due to gain or loss of the DNB internal standard were insignificant. Conversely, recoveries from the soil and water after leaching experiments ranged from 10-15% for TNT, 2-5% for 2,4-DNT, and even less for 2,6-DNT. Due to these low recoveries of the nitroaromatics from the leached soils, the concentrations of explosives in soil extracts, and in aqueous leachates, were often diminished to levels below our criteria of detection. The criterion of detection is defined as the lowest certifiable limit for quantitation. The respective criteria of detection were calculated using the computerized Quality Assurance Program of the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA),[28] based on the methods of Hubaux and Vos.[29] Criteria of detection values were determined separately for leachate (aqueous) and soil samples for each explosive and transformation product, with details and calculations given in Appendix B. Criteria of detection for selected compounds are presented in Table 3.3, as a function of sample matrix.

When a compound was identified but quantitated to be at levels below the criteria of detection, it was termed to be a **"trace"** quantity and identified as **< criterion of detection**; a **zero value (0)** was reported when **"no peak"** was registered by the integration unit of the HPLC (i.e. not detectable) under the analytical conditions described this report (above).

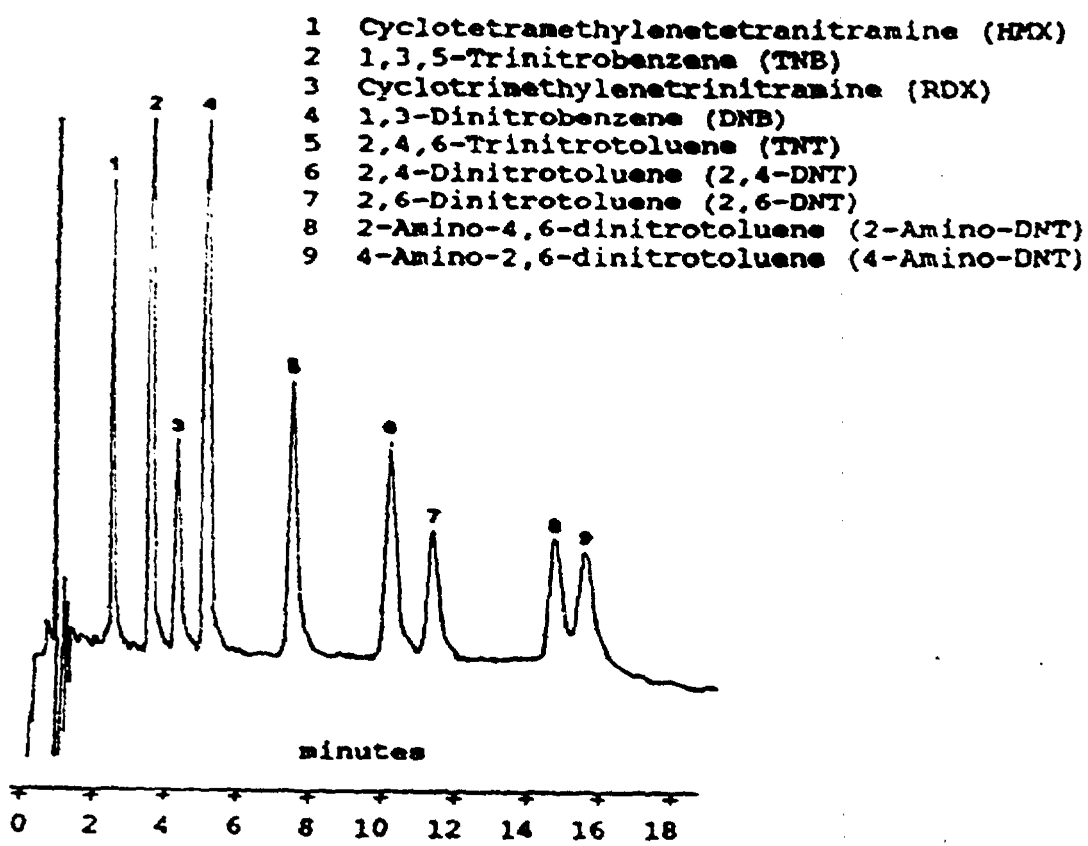


Figure 3.2 An example of the separation of a series of munition residues and associated co-contaminants, by the isocratic HPLC method[12].

Table 3.3 Criteria of Detection* for Selected Explosives and Their Transformation Products for Leachate (Aqueous) and Soil Samples.

Compound	Criteria of Detection by Sample Matrix	
	Leachate ($mg\ L^{-1}$)	Soil ($mg\ kg^{-1}$)
RDX	0.07	5.8
HMX	0.14	2.9
TNT	0.09	6.1
2,4-DNT	0.17	5.7
2,6-DNT	0.37	5.2
2-Amino-DNT	0.14	15.4
4-Amino-DNT	0.12	14.6
TNB	0.15	2.4

* Calculations detailed in Appendix B.

c. Analytical Methods for Metals Determinations by Atomic Absorption Spectrophotometry

Concentrations of Cd, Cr, Cu, Pb, and Zn in uncontaminated soils and OB/OD contaminated ash/soil mixtures from each of the four OB/OD sites were determined in order to compare the background levels of metals in the respective soils with those of the contaminated/fortified (spiked) samples. Complete results from these analyses are reported in Appendix C. Duplicate 4.00 ±0.02 g air-dried subsamples from each of the uncontaminated, contaminated, and contaminated/fortified (spiked) soils were each heated for 3 h on a hot plate in 20 mL 1.0 *M* trace-metal grade HNO_3. When the samples were cool, each was filtered by gravity through Whatman #50 paper, then brought to 50-mL volume with ultrapure water (reverse osmosis followed by double-deionization). All samples were analyzed for total extractable Cd, Cr, Cu, Pb, and Zn levels by atomic absorption spectrophotometry (Perkin-Elmer Model 3030 AA Spectrometer).

Quality assurance and control (QA/QC) for the metal determinations were achieved as follows. Absorbance and

concentration values for standard solutions were initially assessed to assure compliance with the values listed in the Perkin-Elmer methods guide. Standard solutions of the metals were periodically reread (absorbance redetermined) throughout the analyses for each metal determined, to check for instrument drift. Blank solutions were analyzed to detect any possible metal contamination. Additional subsamples were selected at random and prepared in replicate, to verify the analytical results obtained in initial analyses.

4. ANNISTON ARMY DEPOT (AAD)

a. Results

i. Soil Parameters

The soil type detected at the AAD OB/OD area was Clarksville-Fullerton stony/cherty loam [Cherty, kaolinitic, thermic, Typic Paleudults].[18] This particular type of soil was found on upland ridges with slopes ≥15%, developed from old alluvium in residuum of cherty limestone, and is well-drained and quite acidic. Thus soil of this type was sought in an uncontaminated area on-site. Physical and chemical analyses of soil from the uncontaminated site confirmed the Clarksville-Fullerton stony/cherty loam soil type. The soil parameter results are given in Table 4.1.

Table 4.1 Physical and Chemical Characteristics* of Clarksville-Fullerton Stony/Cherty Loam from the Uncontaminated AAD Site.

	SURFACE A HORIZON (0-15 cm) 0-6 INCHES	SUB-SURFACE B HORIZON (15-36 cm) 6-14 INCHES
SAND %	43	44
SILT %	47	39
CLAY %	10	17
ORGANIC MATTER g/kg	34	5
CEC $cmol_c/kg$	4.7	2.8
pH	4.5	4.7

* Values represent replicate determinations by the University of Maryland Soil and Plant Testing Laboratory, College Park, MD.

Concentrations of all metals studied were higher in the contaminated than the uncontaminated Clarksville-Fullerton stony/cherty loam soil (Appendix C). The concentration of each metal in contaminated soil was divided by the concentration in uncontaminated soil to reveal the anthropogenic elevation, in percent. Thus relative concentrations of metals in contaminated

soil were expressed as a percentages of the values from uncontaminated background soil, followed by the determined concentration values (mg kg^{-1}) for the contaminated soil: Cd 350% (3.3), Cr 120% (7.2), Cu 7200% (122), Pb 190% (21.2), and Zn 720% (209). On the basis of the anthropogenic elevations alone, the greatest potential environmental hazard from metallic residues at AAD appears to be due to the elevated Cu and Pb concentrations in OB/OD contaminated soil.

Twelve uncontaminated Clarksville-Fullerton stony/cherty loam soil columns having soil-core depths that were the most similar to the median were selected for preliminary evaluation in accordance with the procedures described in this report. All twelve of the initial soil columns met the thru-put criteria; no additional replacement columns had to be tested. Using these thru-put procedures the initial set of twelve soil-core columns, selected for spiking with contaminated AAD soil, were successfully identified for further investigation.

ii. Leachates

The volumes of leachates collected are presented as a function of time in Appendix D, Table D-1. Leachates were collected twice per week, prior to each application of simulated rain. Average leachate volume per collection ranged from 93-155 mL per column, with standard deviations of the leachate volumes per collection ranging from 0.02-0.54 mL.

Concentrations of munition residues in leachates from AAD soil-cores were determined by HPLC methods described in this report. RDX, HMX (a contaminant of RDX), TNT, 2,4-DNT, and 2,6-DNT all had detectable concentrations in leachates from treatment columns. The breakthroughs of RDX, TNT, 2,4-DNT, and 2,6-DNT are summarized for all AAD treatment columns in Table 4.2. The concentrations of these munition residues in all leachates harvested from intact columns of AAD Clarksville-Fullerton stony (cherty) loam soil are given in Appendix D, Tables D-2.1 through D-2.4. The quantities (masses) of explosives recovered in the column leachates, in ug amounts, are given in Appendix D, Tables D-3.1 through D-3.4. Mass balances for these explosives recovered both in the leachates and from the soils are presented later, in the discussion section.

RDX

Concentration data for RDX in AAD leachates are presented in Appendix D-2.1. Breakthrough of RDX occurred for each of the AAD treatment columns. RDX was not found in any of the leachates from the two control columns.

Columns 5 and 12 were

harvested at day 50 (representing harvest at 6.5 weeks). RDX breakthrough occurred on day 15 for column 5, and day 24 for column 12. RDX concentrations in leachates from columns 5 and 12

Table 4.2 Breakthrough of Explosives at Quantifiable Levels in Leachates from AAD Treatment Soil-Core Columns.

Column Number	Days Operated	Day That Continuing-Breakthrough First Occurred			
		RDX	TNT	2,4-DNT	2,6-DNT
5	50	15	50	*	*
12	50	24	*	*	*
4	91	21	*	53	53
7	91	7	24	11	28
2	137	7	21	15	28
11	137	11	*	*	*
6	181	7	59	49	63
10	181	11	*	59	70
1	228	7	32	24	35
9	228	7	105**	24	42
Average for columns with breakthrough		12	37	34	46
Standard deviation		6	17	20	17

* No continuous breakthrough at quantifiable concentrations.
** Outlier; not included in average.

generally increased over time (to high values of 20 and 23 mg L^{-1}, respectively) as leaching progressed, until the columns were harvested. Columns 4 and 7 were harvested on day 91 (13 weeks). RDX breakthrough occurred on day 21 for column 4 and on day 7 for column 7. RDX concentrations in leachates from these two columns ranged from 0 (undetectable) to 29 mg L^{-1}. Columns 2 and 11 were harvested on day 137 (19.5 weeks). RDX breakthrough occurred on day 7 for column 2 and day 11 for column 11. Leachate concentrations of RDX in column 2 were predominately greater than 30 mg L^{-1} with a peak concentration on day 70 of 56 mg L^{-1}. Column 11 had variable RDX concentrations in leachates, attaining a high

value of only 8 mg L^{-1} on day 137, column harvest (19.5 weeks). Columns 6 and 10 were harvested on day 187 (26 weeks). Breakthrough of RDX occurred on day 7 for column 6 and day 11 for column 10. RDX concentrations in leachates from columns 6 and 10 were generally greater than 20 mg L^{-1}. Columns 1 and 9 were harvested on day 228 (32.5 weeks). RDX breakthrough occurred on day 7 for both of these columns. Leachate concentrations of RDX from these two columns increased over time as leaching progressed to values typically greater than 20 mg L^{-1}.

Breakthrough of RDX in continuing quantifiable concentrations occurred for all treatment columns. Overall the breakthrough of RDX in leachates from treament columns ranged from days 7-24, with a mean of day 12.

TNT

Concentrations of TNT in AAD leachate are given in Appendix D-2.4. Detectable but nonquantifiable "trace" levels of TNT first appeared in the leachates from treatment columns on day 11, in the leachate from column 11. The last column to have trace quantities initially appear was column 10 on day 53. No TNT was found in any of the leachates from control columns.

Columns 5 and 12 were harvested first, at day 50 (representing harvest at 6.5 weeks). TNT was detected at 0.4 mg L^{-1} in leachate from column 5 on day 50, with none detected in leachate from column 12 by its harvest on day 50. Columns 4 and 7 were harvested on day 91 (13 weeks). TNT was not detected in the leachate from column 4. For column 7, TNT in leachate was first detected (<0.09 mg L^{-1}) at day 11, and breakthrough occurring on day 24 with TNT generally present in leachates through harvest of the column. A trace level (<0.09 mg L^{-1}) of TNT was first detected in leachate from column 2 at day 15. Continuing breakthrough of TNT from column 2 into leachate 2 occurred on day 21, with concentrations in leachate peaking on days 53-59, then decreasing through column harvest on day 137 (19.5 weeks). Column 11 had no detectable TNT in the leachate over the 137 days to its harvest at 19.5 weeks. Columns 6 and 10, both harvested on day 183 (26 weeks), first had trace levels (<0.09 mg L^{-1}) of TNT in leachates on days 35 and 53, respectively. Breakthrough of TNT occurred on day 59 for column 6, with detectable concentrations in leachate ranging from <0.09-0.76 mg L^{-1} from days 59-157; no detectable levels of TNT were present between days 161-183. For column 10, sporadic quantifiable levels of TNT in the leachate were found beginning on day 56, with concentrations ranging as high as 3 mg L^{-1} on days 161 and 168. Columns 1 and 9 were harvested on day 228 (32.5 weeks). For column 1, breakthrough of TNT occurred on day 24 with concentrations of TNT in leachates generally ranging between 0.8-3 mg L^{-1} during days 32-143, and with generally lower more sporadic

concentrations between days 143-228. For column 9, breakthrough of TNT occurred on day 105 with the concentration of TNT in leachate peaking at 15 mg L^{-1} on day 116, and with generally lower more sporadic concentrations of TNT in leachates between days 119-228.

Breakthrough of TNT in continuing quantifiable concentrations occurred in six of the ten treatment columns. Overall the breakthrough of TNT ranged from days 21-105, and averaged 48 $\pm$31 days; however, discounting day 105 (an outlier), breakthrough ranged from days 21-59 with a mean value of 37 $\pm$17 days.

2,4-DNT

Concentration data for 2,4-DNT in leachates are presented in Appendix D, Table D-2.2. Detectable but nonquantifiable "trace" levels of 2,4-DNT appeared in leachates from seven of the ten treatment columns, on average on day 30; one additional column initially had quantifiable (rather than trace) concentrations of 2,4-DNT in leachate, on day 15. The earliest appearance of trace levels of 2,4-DNT occurred in leachate from column 7 on day 7, and the last column to have trace quantities initially appear was column 10 on day 53. No 2,4-DNT was found in leachates from any of the control columns.

Columns 5 and 12 were harvested on day 50 (representing harvest at 6.5 weeks). No 2,4-DNT was detected in leachates from column 12, but trace amounts (<0.17 mg L^{-1}) were found in leachates from column 5 beginning on day 35 and continuing through column harvest. Columns 4 and 7, both harvested on day 91 (13 weeks), had continuing quantifiable breakthrough of 2,4-DNT beginning on day 53 for column 4, and on day 11 for column 7. Following breakthrough, quantifiable concentrations of 2,4-DNT were found in the leachates from columns 4 and 7 until these columns were harvested. High values of 2,4-DNT in leachates from columns 4 and 7 were 2.0 and 2.8 mg L^{-1}, respectively. Columns 2 and 11 were harvested on day 137 (19.5 weeks). Breakthrough of 2,4-DNT occurred on day 15 in column 2, and concentrations of 2,4-DNT in leachates ranged as high as 6.4 mg L^{-1}. In column 11 breakthrough did not occur. For columns 6 and 10, both harvested on day 181 (26 weeks), continuing quantifiable breakthrough of 2,4-DNT occurred on days 49 and 59, respectively. Concentrations of 2,4-DNT in leachates from columns 6 and 10 both ranged to high values of 4 mg L^{-1}. From day 59 onward, concentrations of 2,4-DNT in leachates from column 6 remained >1 mg L^{-1} until the column was harvested. In column 10 from day 98 onward, concentrations in leachates were typically >1 mg L^{-1} until that column was harvested. Continuing quantifiable breakthrough of 2,4-DNT occurred day 24 in both columns 1 and 9, harvested last on day 228 (32.5 weeks). Concen-

trations of 2,4-DNT in leachates from column 1 were substantially higher than those from column 9, with values two-to-ten times as great. High values for 2,4-DNT in leachates from columns 1 and 9 were 9.8 and 1.8 mg L^{-1}, respectively.

Breakthrough of 2,4-DNT occurred at quantifiable levels in seven out of ten of the intact AAD soil columns that received treatment. Breakthrough of 2,4-DNT in this Clarksville-Fullerton stony (cherty) loam soil ranged from 11 to 59 days, and averaged 34 days. Three of the treatment soil columns never had continuing measurable breakthrough.

2,6-DNT

Concentrations of 2,6-DNT in AAD leachate are given in Appendix D-2.3. Detectable but nonquantifiable "trace" levels of 2,6-DNT first appeared in the leachates from treatment columns on day 7, in leachate from column 9. The last column to have trace quantities initially appear was column 10 on day 53. Eight of the ten treatment columns had trace levels of 2,6-DNT in leachates preceeding continuing quantifiable breakthrough. No 2,6-DNT was found in leachates from any of the control columns.

Columns 5 and 12 were harvested on day 50 (representing harvest at 6.5 weeks). Column 5 had trace levels (<0.37 mg L^{-1}) of 2,6-DNT in leachates beginning on day 42, but column 12 had none detected. No quantifiable levels of 2,6-DNT were detected in the leachates from either of these columns through their harvest on day 50. Columns 4 and 7, harvested on day 91 (13 weeks), both had trace levels of 2,6-DNT in leachate that preceeded breakthrough at quantifiable levels. Column 4 had trace levels of 2,6-DNT beginning on day 42, with breakthrough occurring on day 53. For column 7, trace levels of 2,6-DNT in leachates began on day 11, with breakthrough on day 28. Once breakthrough occurred in columns 4 and 7, concentrations of 2,6-DNT were typically ranged about 1 mg L^{-1} until the columns were harvested at 13 weeks. Columns 2 and 11 were both harvested on day 137 (19.5 weeks). For column 2, trace levels of 2,6-DNT in leachates began on day 15, and quantifiable breakthrough occurred on day 28. Column 11 had no detectable levels of 2,6-DNT in its leachates, and through its harvest at 19.5 weeks had no observable breakthrough. In columns 6 and 10, both harvested on day 181 (26 weeks), trace levels of 2,6-DNT were detected in leachates beginning on days 42 and 53 respectively, with 2,6-DNT breakthrough on day 63 and 70. Following breakthrough, measurable concentrations of 2,6-DNT were observed in leachates from these columns, until they were harvested. Columns 1 and 9 were the last treatment columns harvested, on day 228 (32.5 weeks). For both of these columns, trace levels of 2,6-DNT were found in their leachates beginning on days 15 and 7 respectively, preceeding quantifiable breakthrough. Breakthrough

of 2,6-DNT occurred in column 1 on day 35, with concentrations increasing to a peak level of 4.5 mg L^{-1} on day 196. In column 9 quantifiable breakthrough occurred on day 42, but afterward until day 108 only trace levels of 2,6-DNT were found in leachates. From day 108 through harvest of this column, concentrations of 2,6-DNT in the leachates from column 9 typically ranged about 0.5 mg L^{-1}.

Breakthrough of 2,6-DNT occurred at quantifiable levels in the same seven out of ten intact AAD soil columns that had breakthrough of 2,4-DNT. Breakthrough of 2,6-DNT in this Clarksville-Fullerton stony (cherty) loam soil ranged from 28 to 70 days, and averaged 46 days. No measurable breakthrough of 2,6-DNT in the same three treatment soil columns that had no breakthrough of 2,4-DNT.

Amino-DNTs

Detectable but nonquantifiable "trace" levels of 2-amino-DNT (<0.14 mg L^{-1}) and 4-amino-DNT (<0.12 mg L^{-1}) were found in some leachates from the AAD treatment soil columns. No amino-DNTs were found in any of the leachates from the two AAD control soil columns. Column 7 was the first to have trace amounts of amino-DNTs appear in leachates, with 2-amino-DNT appearing first on day 7 and 4-amino-DNT on day 11. The last columns to have trace quantities of amino-DNTs initially appear were column 10 on day 77 for 2-amino-DNT (with 4-amino-DNT appearing on day 70), and column 4 for 4-amino-DNT on day 73 (with 2-amino-DNT also appearing on the same day). Typically, once an amino-DNT appeared in column leachate it was consistently detected at trace levels until the column was harvested.

Neither 2-amino-DNT or 4-amino-DNT were detected in the leachates from columns 5 and 12 (harvested on day 50, representing harvest at 6.5 weeks). Columns 4 and 7 were harvested on day 91 (13 weeks). Both amino-DNTs were detected at trace levels in leachate 12from column 4 beginning on day 73. For column 7, 2-amino-DNT was initially detected in leachate on day 7, and 4-amino-DNT on day 11. Columns 2 and 11 were harvested on day 137 (19.5 weeks). Both of the amino-DNTs were detected in leachate from column 2 on day 15, but neither were found in leachates from column 11. Columns 6 and 10 were harvested on day 181 (26 weeks). Both amino-DNTs were detected in leachate from column 6 on day 59. For column 10, 2-amino-DNT was initially detected in leachate on day 77, and 4-amino-DNT on day 70. The final columns harvested were columns 1 and 9 on day 228 (32.5 weeks). For column 1, both amino-DNTs were detected in leachates at trace levels on day 15. Column 9 had trace amounts of 2-amino-DNT appear in leachate on day 32, and 4-amino-DNT on day 35.

Seven of the ten treatment columns had trace levels of amino-DNTs that, once present in the leachate, were consistently detected (although never at quantifiable concentrations). Only three of the treatment columns never had detectable levels of amino-DNTs in their leachates. In leachates from four of the seven treatment columns, both amino-DNTs initially appeared on the same day. The remaining three columns with amino-DNTs in leachates, had spans of only 3, 4, and 7 days between initial appearances of the amino-DNTs in their respective leachates.

iii. Soil

Concentrations of munition residues in AAD soils were determined by the HPLC methods described in this report. Results of analyses for concentrations of munition residues and their transformation products for each soil-core section, from all AAD treatment and control soil-core columns, are given in Appendix D, Tables D-4.1 through D-4.6. The quantities (masses) of explosives recovered from the soil, in ug amounts, are given in Appendix D, Tables D-4.7 through D-4.12. Mass balances of explosives recovered from these soils and in the leachates are presented later, in the discussion section.

There were no quantifiable munition residues or transformation products of explosives present in the OB/OD-contaminated soil from AAD. The soil and explosives mixture, 1" (2.5 cm) of which was applied to the top of each treatment soil column, contained 1000 mg kg^{-1} (ppm) each of RDX, TNT, and 2,4-DNT, and 400 mg kg^{-1} 2,6-DNT. During this study, two treatment soil cores were randomly selected for each harvest, at 6.5, 13, 19.5, 26 and 32.5 weeks of the study. The results that follow are from triplicate analyses of each 1" (2.5 cm) section by depth, of duplicate treatment soil-core columns leached and harvested at intervals. No explosives or transformation products were found in any of the soil sections from the AAD control soil columns.

RDX

Concentrations of extractable RDX in the top 1" (0-2.5 cm section) of soil columns harvested at 6.5, 13, 19.5, 26, and 32.5 weeks, averaged 1026, 690, 460, 290, and 360 mg kg^{-1} respectively. The average concentrations of RDX at the same depths within the next 5" (2.5-15 cm), remained at similar magnitudes over time as leaching progressed. Concentrations of RDX averaged by common depth from 1-6" (2.5-15 cm) averaged over all harvests were (mg kg^{-1}):

250 at 2" (2.5-5 cm);
45 at 3" (5-7.5 cm);
17 at 4" (7.5-10 cm);
13 at 5" (10-12.5 cm); and

10 at 6" (12.5-15 cm), excluding from this final average value two columns that had <5.8 mg kg^{-1} RDX at the 6" (12.5-15 cm) depth.

TNT

Average TNT concentrations in the top 6" (0-15 cm) of treatment soil-core columns are given for each harvest (at 6.5, 13, 19.5, 26, and 32.5 weeks) as a function of depth, in Figures 4.6 through 4.10. At 6.5 weeks (50-day interval), TNT concentrations in the top two 1" (0-2.5 and 2.5-5 cm) soil sections had decreased to mean concentrations of 314 and 165 mg kg^{-1} respectively. Quantifiable concentrations of TNT were found to a depth of 5" (0-12.5 cm) for column 5, with a trace (<6.1 mg kg^{-1}) at 6" (12.5-15 cm). In column 12, quantifiable concentrations of TNT occurred to a depth of 4" (0-10 cm), followed by traces of TNT to 6" (10-15 cm). At 13 weeks, the

FIGURE 4.1 RDX AND HMX (AVG.) CONC. IN CLARKSVILLE-FULLERTON STONY/CHERTY LOAM: 6.5 WEEK LEACHING.

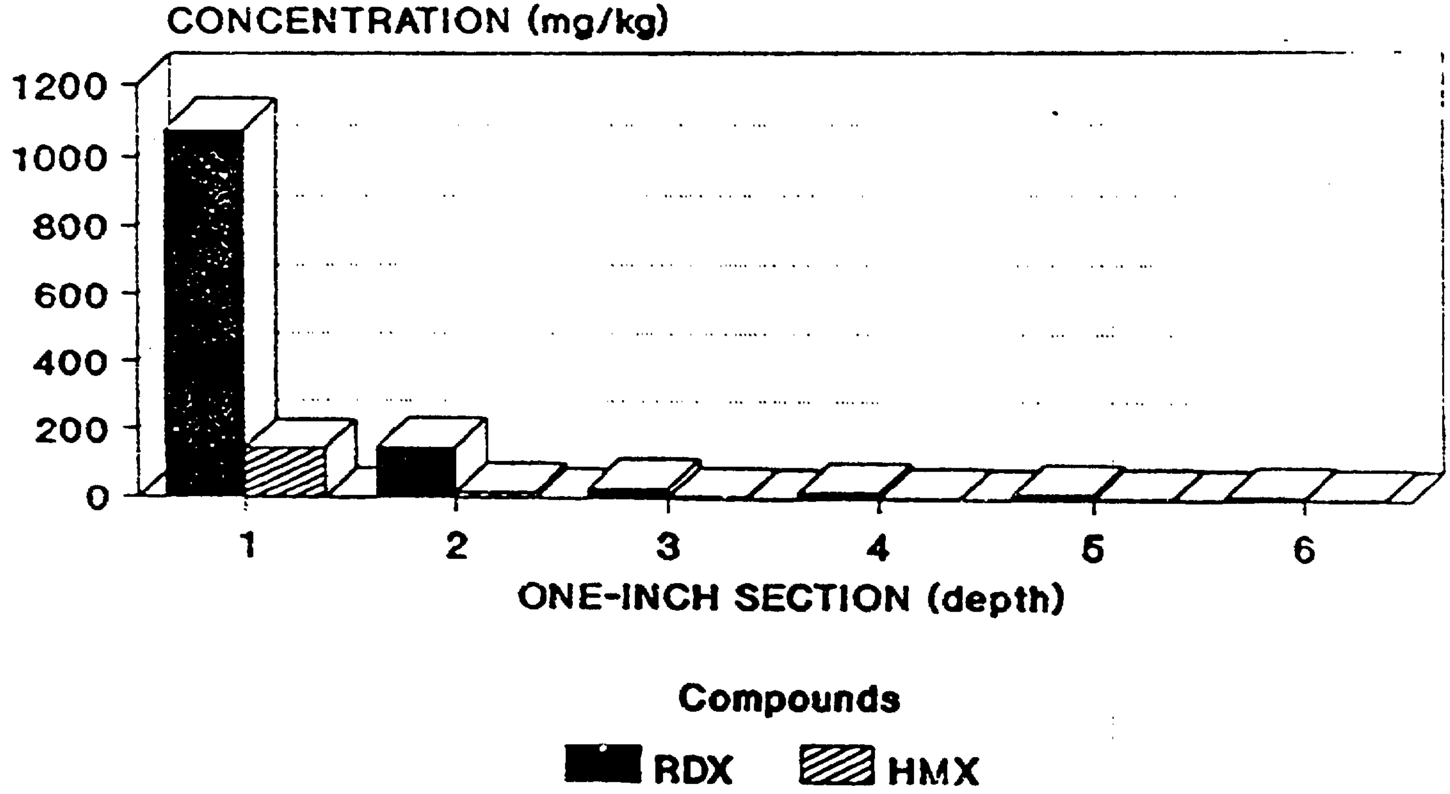


FIGURE 4.2 RDX AND HMX (AVG.) CONC. IN CLARKSVILLE-FULLERTON STONY/CHERTY LOAM: 13 WK LEACHING.

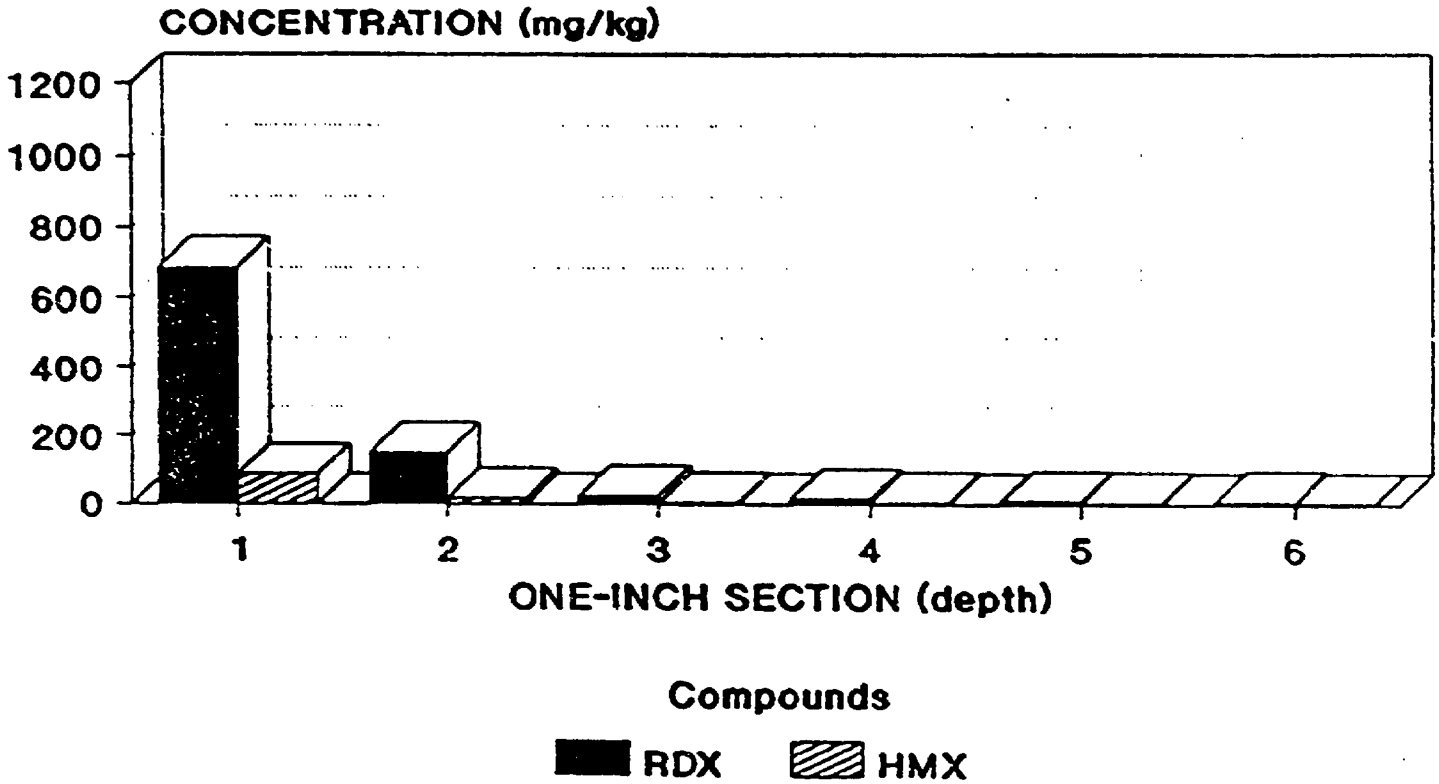


FIGURE 4.3 RDX AND HMX (AVG.) CONC. IN CLARKSVILLE-FULLERTON STONY/CHERTY LOAM: 19.5 WEEK LEACHING.

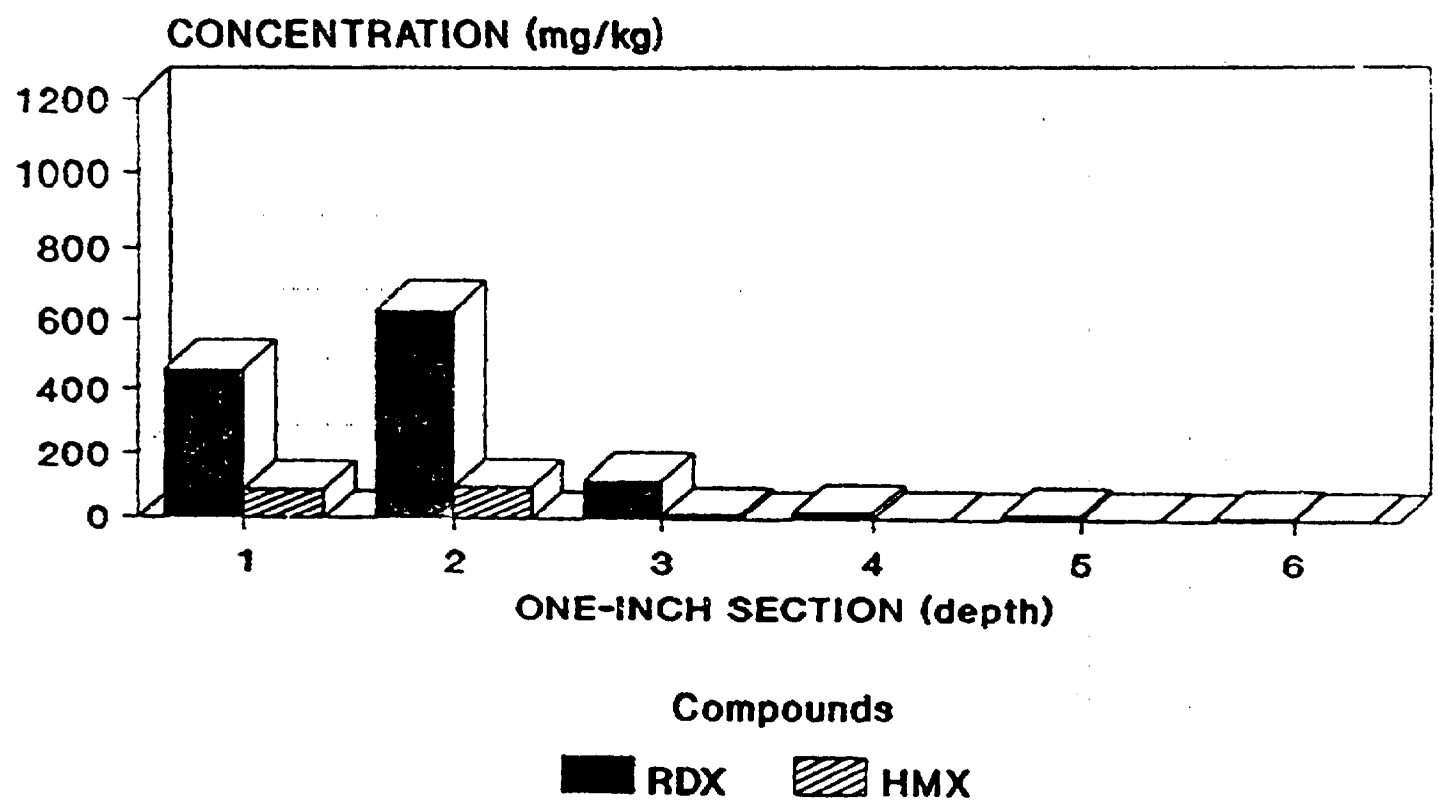


FIGURE 4.4 RDX AND HMX (AVG.) CONC. IN CLARKSVILLE-FULLERTON STONY/CHERTY LOAM: 26 WEEK LEACHING.

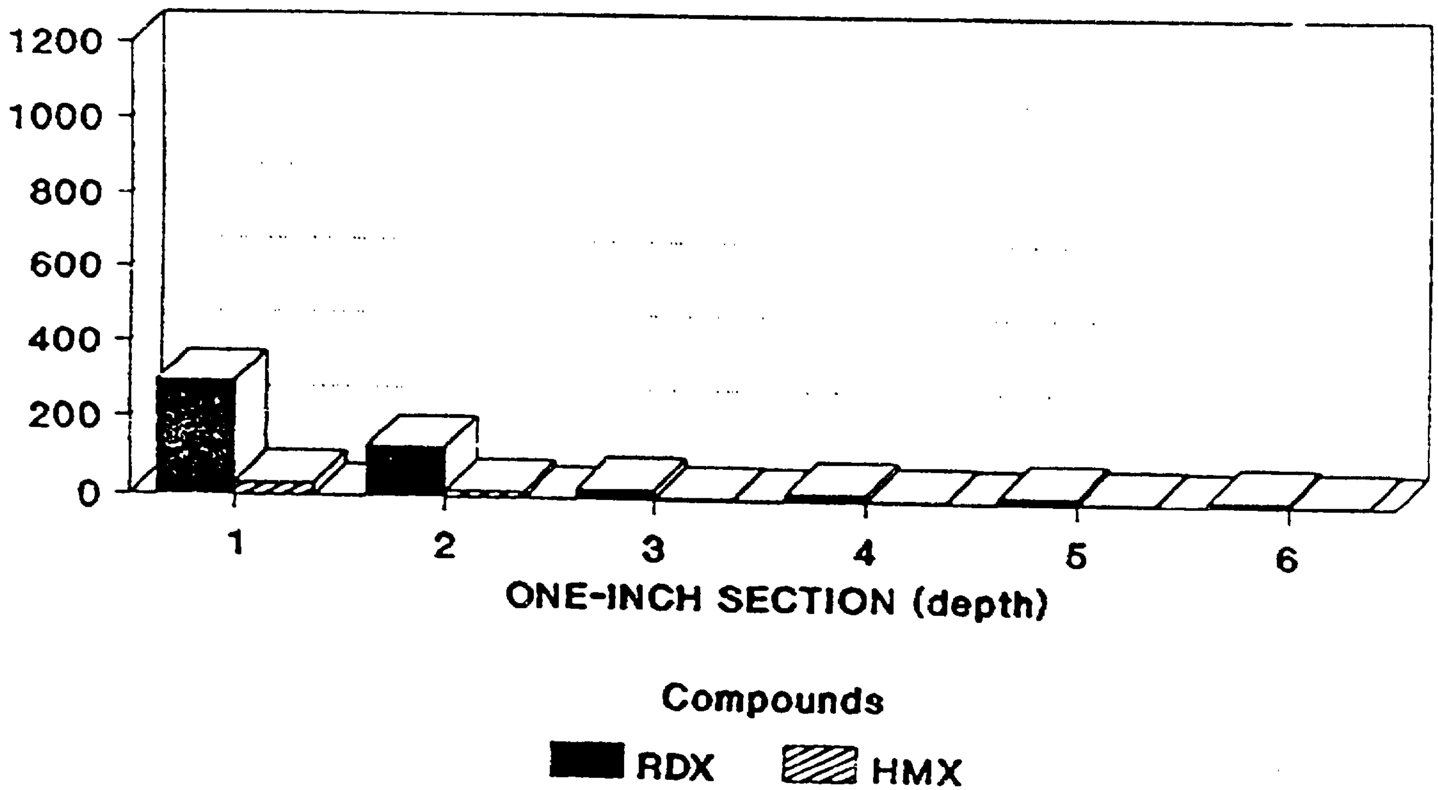


FIGURE 4.5 RDX AND HMX (AVG.) CONC. IN CLARKSVILLE-FULLERTON STONY/CHERTY LOAM: 32.5 WEEK LEACHING.

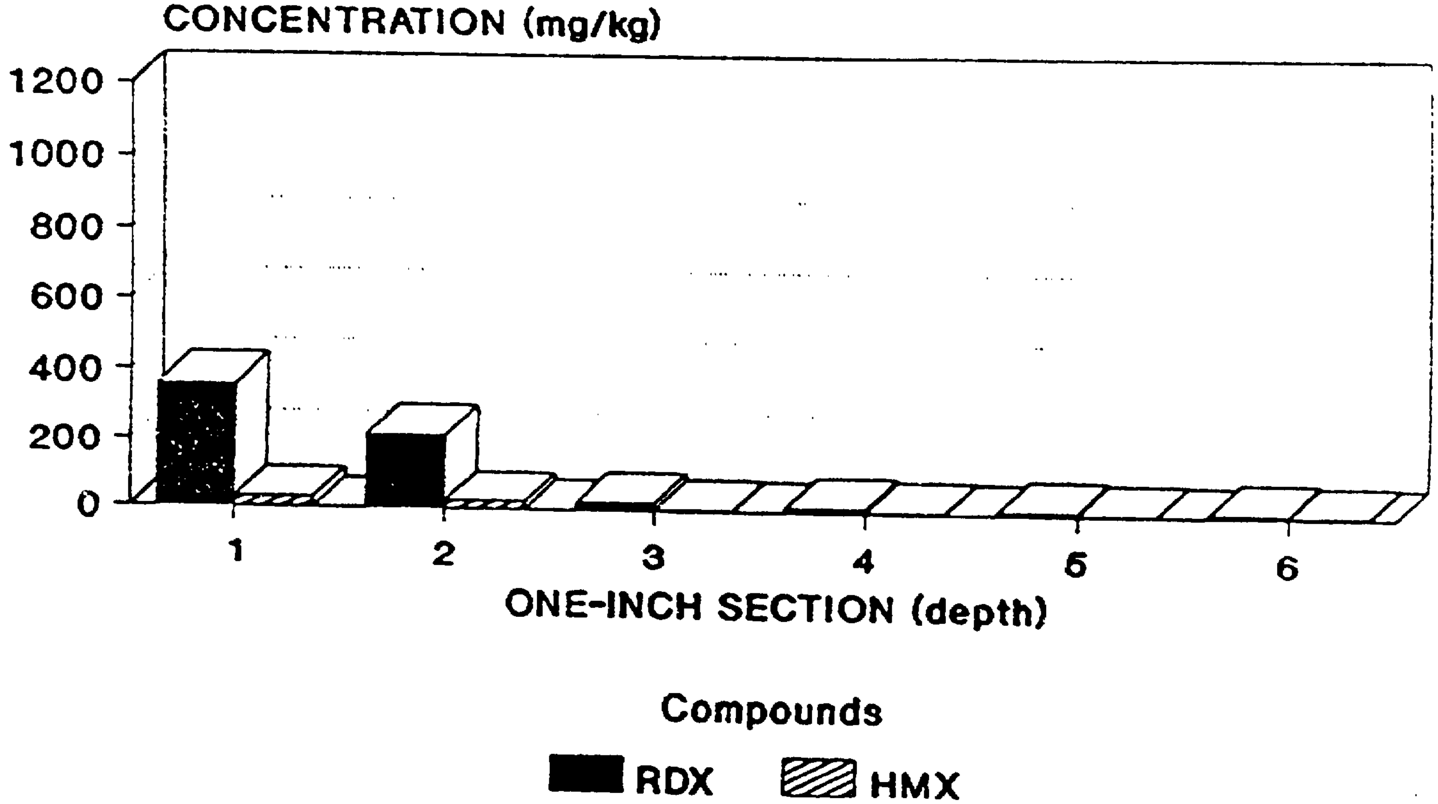


FIGURE 4.6 TNT, 2,4-DNT AND 2,6-DNT (AVG.) CONC. IN CLARKSVILLE-FULLERTON STONY /CHERTY LOAM: 6.5 WK LEACHING.

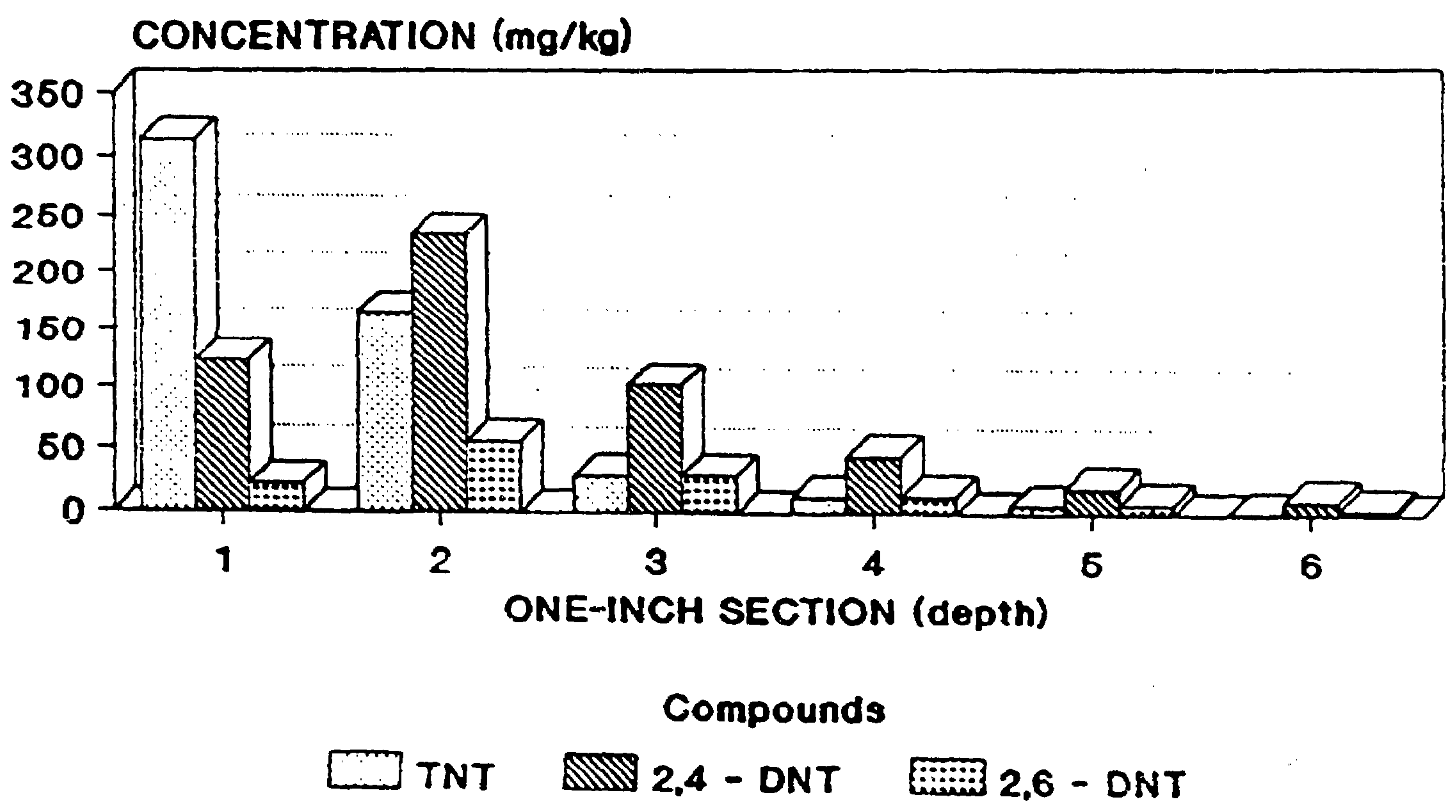


FIGURE 4.7 TNT, 2,4-DNT AND 2,6-DNT (AVG.) CONC. IN CLARKSVILLE-FULLERTON STONY /CHERTY LOAM: 13 WK LEACHING.

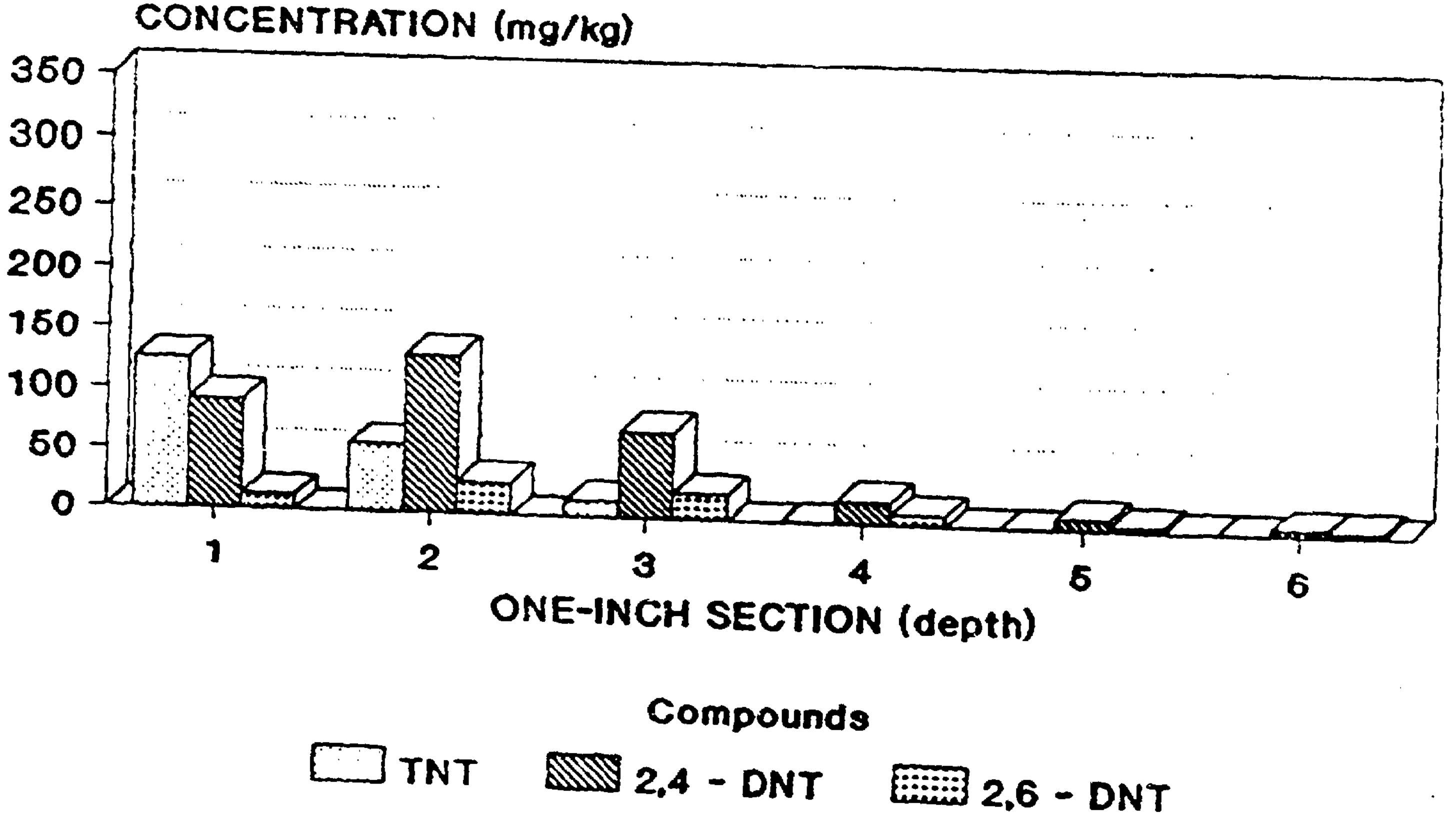


FIGURE 4.8 TNT, 2,4-DNT AND 2,6-DNT (AVG.) CONC. IN CLARKSVILLE-FULLERTON STONY /CHERTY LOAM: 19.5 WK LEACHING.

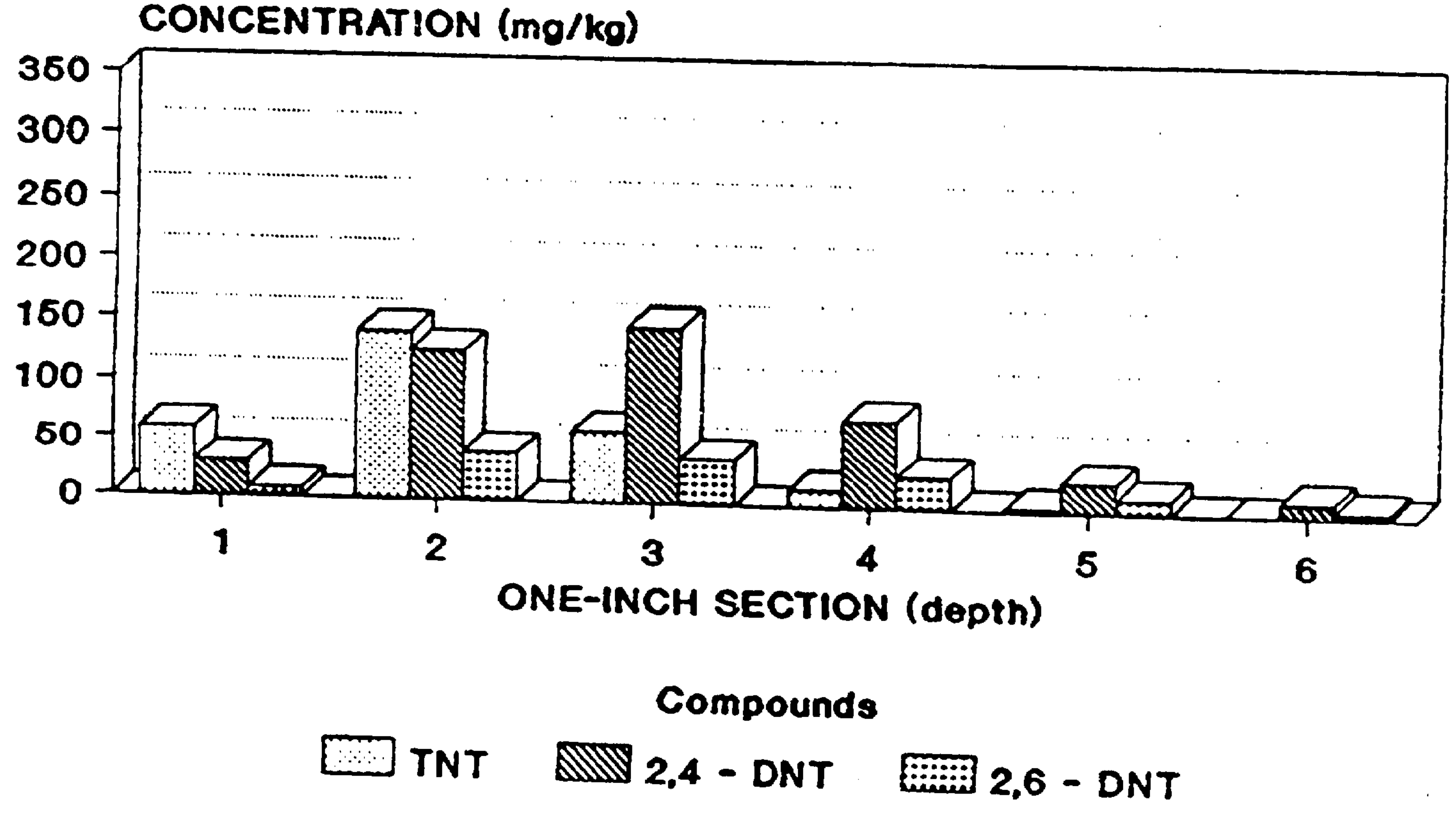


FIGURE 4.9 TNT, 2,4-DNT AND 2,6-DNT (AVG.) CONC. IN CLARKSVILLE-FULLERTON STONY /CHERTY LOAM: 26 WK LEACHING.

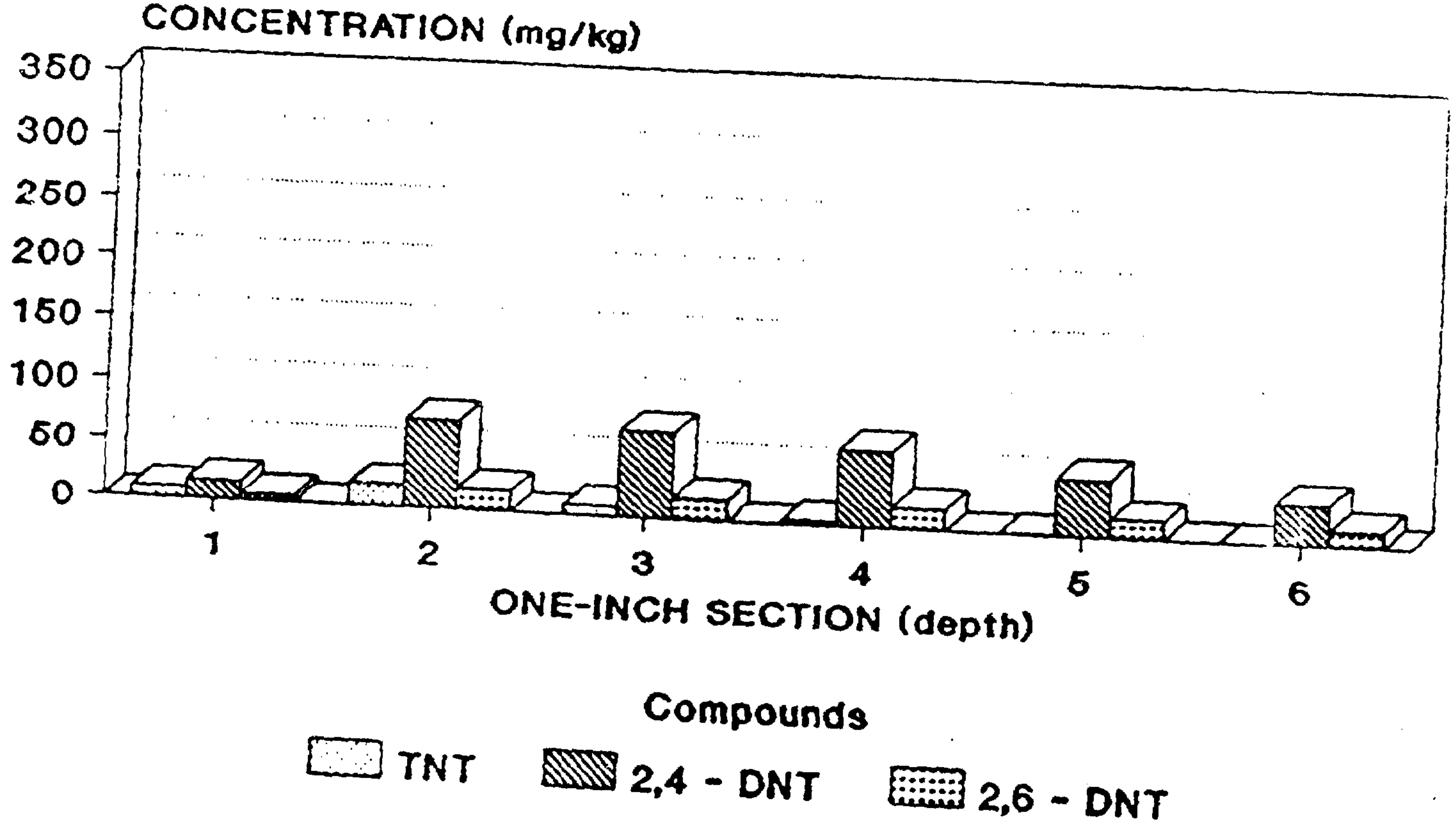
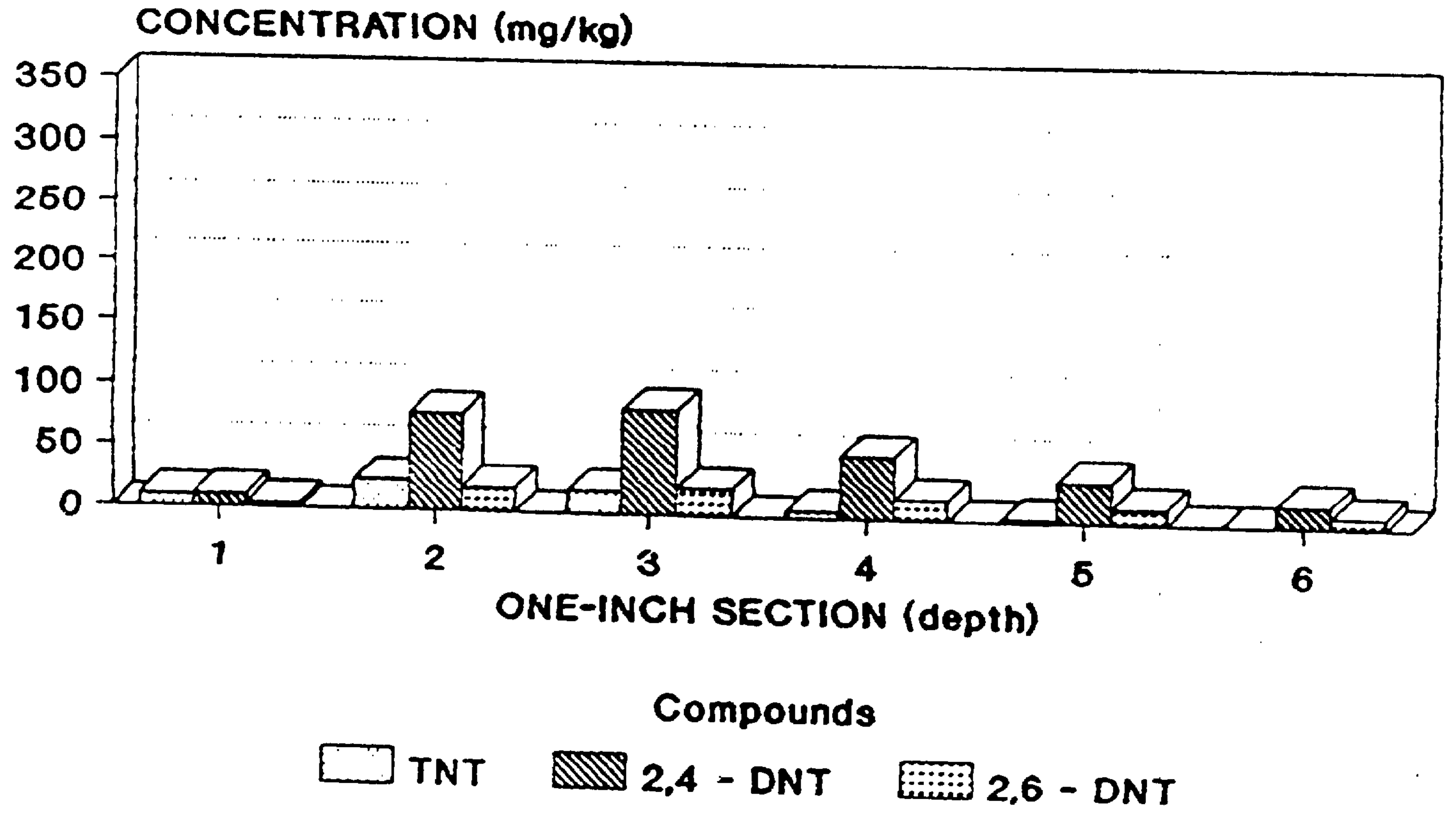


FIGURE 4.10 TNT, 2,4-DNT AND 2,6-DNT (AVG.) CONC. IN CLARKSVILLE-FULLERTON STONY /CHERTY LOAM: 32.5 WK LEACHING.



concentrations of TNT in columns 4 and 7 had declined to a mean concentration of 125 and 57 mg kg^{-1} respectively in the top two 1" (0-2.5 and 2.5-5 cm) soil sections. Quantifiable concentrations of TNT were found to a depth of 3" (0-7.5 cm), and traces of TNT were detected to 4" (10 cm). At 19.5 weeks, columns 2 and 11 were harvested. TNT concentrations in the first two 1" (0-2.5 and 2.5-5 cm) sections averaged 60 and 141 mg kg^{-1} respectively. Quantifiable TNT concentrations were found no deeper than 4" (10 cm), and traces of TNT no deeper than 5" (12.5 cm). Columns 6 and 10 were harvested at 26 weeks. Average TNT concentrations had decreased to <10 mg kg^{-1} in the top 1" (0-2.5 cm) of the soil, and in the second inch (2.5-5 cm) to 19 mg kg^{-1}. Quantifiable levels of TNT were found no deeper than the 3" (5-7.5 cm) section, and traces of TNT no deeper than the 5" (10-12.5 cm) section. At 32.5 weeks, columns 1 and 10 averaged 9 and 23 mg kg^{-1} in the top two 1" (0-2.5 and 2.5-5 cm) soil sections. Quantifiable concentrations of TNT were found to a maximum depth of 4" (7.5-10 cm section), and traces of TNT to 5" (10-12.5 cm section).

2,4-DNT

Average 2,4-DNT concentrations in the top 6" (0-15 cm) of treatment soil-core columns are given for each harvest (at 6.5, 13, 19.5, 26, and 32.5 weeks) as a function of depth, in Figures 4.6 through 4.10. Columns 5 and 12 were harvested on day 50 (representing 6.5 weeks), and concentrations of 2,4-DNT averaged 123, 234, and 103 mg kg^{-1} in the first three 1" (0-2.5, 2.5-5, and 5-7.5 cm) sections. Concentrations of 2,4-DNT in the next three 1" (7.5-10, 10-12.5, and 12.5-15 cm) sections of columns 5 and 12 averaged 45, 20, and 10 mg kg^{-1} respectively. Concentrations of 2,4-DNT averaged 92, 131, and 73 mg kg^{-1} in the first three 1" (0-2.5, 2.5-5, and 5-7.5 cm) sections of columns 4 and 7, harvested at 13 weeks. In the next two 1" (7.5-10, 10-12.5, and 12.5-15 cm) sections of columns 4 and 7, 2,4-DNT averaged 20 and 9 mg kg^{-1} respectively; and the sections at 6" depth (12.5-15 cm) declined to 8 mg kg^{-1} in column 4 and <5.7 (< criterion of detection) in column 7. At 19.5 weeks columns 2 and 11 were harvested. For columns 2 and 11 the top 1" (0-2.5 cm) section of soil averaged only 30 mg kg^{-1}, however the next three 1" (2.5-5, 5-7.5, and 7.5-10 cm) sections averaged 127, 148, and 76 mg kg^{-1} respectively; with mean 2,4-DNT values in the 5-6" (10-12.5 and 12.5-15 cm) sections of 25 and 12 mg kg^{-1}. The mean concentration in the top 1" (0-2.5 cm) of soil in columns 6 and 10, harvested at 26 weeks, was 16 mg kg^{-1}. The next three 1" (2.5-5, 5-7.5, and 7.5-10 cm) sections averaged 75, 73, and 65 mg kg^{-1} respectively; with mean 2,4-DNT values in the 5-6" (10-12.5 and 12.5-15 cm) sections at 49 and 35 mg kg^{-1} respectively. At 32.5 weeks, columns 1 and 9 were harvested. The mean concentration of 2,4-DNT in the top 1" (0-2.5 cm) of soil was 10 mg kg^{-1}. The next three 1" (2.5-5, 5-7.5, and 7.5-10 cm) section averaged 79, 84, and 50 mg kg^{-1} respectively; with

mean 2,4-DNT values in the 5-6" (10-12.5 and 12.5-15 cm) sections of 33 and 17 mg kg^{-1}.

2,6-DNT

Average 2,6-DNT concentrations in the top 6" (0-15 cm) of treatment soil-core columns are given for each harvest (at 6.5, 13, 19.5, 26, and 32.5 weeks) as a function of depth, in Figures 4.6 through 4.10. At 6.5 weeks (50-day interval) the 2,6-DNT concentrations averaged 21, 56, and 29 mg kg^{-1} in the first three 1" (0-2.5, 2.5-5, and 5-7.5 cm) sections of columns 5 and 12. Concentrations of 2,6-DNT in the next three 1" (7.5-10, 10-12.5, and 12.5-15 cm) sections of columns 5 and 12 averaged 13, 8, and <5.2 mg kg^{-1} respectively. The same pattern of 2,6-DNT concentrations occurred at the 13 week harvest, but with somewhat lower concentration values. Concentrations of 2,6-DNT in columns 4 and 7 harvested at 13 weeks averaged 13, 28, and 23 mg kg^{-1} in the first three 1" (0-2.5, 2.5-5, and 5-7.5 cm) sections of columns 4 and 7. The mean concentration of 2,6-DNT in the next 1" (7.5-10 cm) section of columns 4 and 7 was 9 mg kg^{-1}; and at 5-6" depth (10-12.5 and 12.5-15 cm) the sections declined to <5.2 mg kg^{-1} (< criterion of detection). By 19.5 weeks, columns 2 and 11 averaged 7 mg kg^{-1} the top 1" (0-2.5 cm) section of soil, and the next three 1" (2.5-5, 5-7.5, and 7.5-10 cm) sections averaged 21, 39, and 28 mg kg^{-1} respectively. The mean 2,6-DNT value in the 5" depth (10-12.5 cm) soil section was <5.2 mg kg^{-1}, and at 6" depth (12.5-15 cm) the section from column 2 was 8 mg kg^{-1} while that from column 11 was <5.2 mg kg^{-1}. At 19.5 weeks, the concentrations in the top 1" (0-2.5 cm) of soil in columns 6 and 10 were <5.2 and 9 mg kg^{-1} respectively. The next three 1" (2.5-5, 5-7.5, and 7.5-10 cm) sections each averaged 18 mg kg^{-1}; with mean 2,4-DNT values in the 5-6" (10-12.5 and 12.5-15 cm) sections of 16 and 13 mg kg^{-1}. At the 32.5 weeks soil column harvest, the mean concentration of 2,6-DNT in the top 1" (0-2.5 cm) of soil in both columns 1 and 9 was <5.2 mg kg^{-1}. The next three 1" (2.5-5, 5-7.5, and 7.5-10 cm) sections averaged 19, 21, and 16 mg kg^{-1} respectively; with mean 2,4-DNT values in the 5-6" (10-12.5 and 12.5-15 cm) sections of 12 and 8 mg kg^{-1} respectively.

Amino-DNTs

Soil columns 5 and 12 were harvested on day 50 (representing 6.5 weeks). No 2-amino-DNT was found in the top 1" (0-2.5 cm) of soil in either of these columns, however trace (<15.4 mg kg^{-1}) amounts were found in both columns in the 2-4" depth (2.5-5, 5-7.5, and 7.5-10 cm) soil sections. Furthermore, additional traces of 2-amino-DNT were found in column 12 in the 5-6" depth (10-12.5 and 12.5-15 cm) soil sections. No 4-amino-DNT was detected at 6.5 weeks in either column. At 13 weeks, 2-amino-DNT was detected in trace amounts in the top 4" (0-10 cm) of both columns 4 and 7, with an

additional trace amount at 6" depth (12.5-15 cm) in column 7. No 4-amino-DNT was detected at 13 weeks in either column 4 or 7. At 19.5 weeks, traces of 2-amino-DNT were detected throughout the top 6" (0-15 cm) of column 2, and for column 11 in the 2-4" and 6" depth (2.5-5, 5 7.5, 7.5-10, and 12.5-15 cm) soil sections. No 4-amino-DNT was detected in column 2 at 19.5 weeks, however column 11 had a trace of 4-amino-DNT in only the 2" depth (2.5-5 cm) soil section. Columns 6 and 10, harvested at 26 weeks, both had trace amounts of 2-amino-DNT throughout the top 6" (0-15 cm) of soil. No 4-amino-DNT was detected at 26 weeks in either column 6 or 10. At 32.5 weeks, with the exception of the top 1" (0-2.5 cm) section of column 1, both columns 1 and 9 had trace amounts of 2-amino-DNT throughout the top 6" (0-15 cm) of soil. No 4-amino-DNT was detected at 32.5 weeks, in either column.

b. Discussion

RDX, HMX (an explosive, and a contaminant of RDX), TNT, 2,4-DNT, 2,6-DNT, and 2-amino-DNT and 4-amino-DNT (both transformation products of TNT)[30] were detected in leachates from the AAD treatment columns. No TNB (a transformation product of TNT) or other degradation products were found in the leachates.[31]

In this Clarksville-Fullerton stony/cherty loam soil from the AAD site, both RDX and its contaminant HMX were very mobile. Transport of RDX in the soil column leachates occurred relatively quickly throughout the treatment columns, with half of the columns having RDX breakthrough by day 7. Eighty percent of the treatment columns had RDX breakthrough by day 15, with the remaining two columns having RDX breakthrough by day 24. Overall, mean breakthrough of RDX at quantifiable levels occurred on day 12 (Table 4.2). Following RDX breakthrough, concentrations in leachates generally increased to a mean maximum on day 143, then slowly declined in concentration through day 228 (32.5 weeks, the final harvest). Between days 7 and 28 mean RDX concentration (mg L^{-1}) in leachates was in the single-digits, then increased between days 32 and 59 into the teens, between days 63 and 80 was in the twenties, and between days 84 and 143 increased into the thirties; then concentrations slowly decreased into the twenties between days 147 and 203, and finally again into the teens between day 207 and the final harvest on day 228. HMX (a contaminant of RDX) was also detected in the leachates. On day 3 traces of HMX were detected in leachates. On day 7, HMX in leachates averaged 0.17 mg L^{-1}. At 6.5, 13, 19.5, 26, and 32.5 respectively, concentrations of HMX in leachates averaged 0.65, 1.5, 1.8, 2.1, and 1.4 mg L^{-1}, approximately an order of magnitude lower than the corresponding RDX values.

Although transport of TNT in the soil column leachates occurred much more slowly throughout the treatment columns than that for RDX, breakthrough of TNT in quantifiable

concentrations in leachate occurred in six of the ten treatment col ns. Overall (discounting the single outlier), TNT breakthrough ranged from days 21-59 with a mean value of 37 days. TNT elution curves consisted of low intensity very broad peaks. Typically following TNT breakthrough, concentrations (mg L^{-1}) in leachates slowly increased to values no higher than mid-single-digits, then decreased to undetectable levels prior to final harvest (day 228).

Breakthrough of 2,4-DNT at quantifiable levels occurred in seven out of ten of the intact AAD soil treatment columns. When breakthrough of 2,4-DNT occurred in this Clarksville-Fullerton stony/cherty loam soil, it ranged from 11 to 59 days and averaged 34 days. Transport of 2,4-DNT throughout the treatment soil columns in leachates occurred somewhat more quickly than that for TNT, and with measureably greater concentration values. Following breakthrough, 2,4-DNT concentrations (mg L^{-1}) in leachates typically increased to mid-single-digits or higher (some approaching double-digit values) for sustained periods (weeks). As leaching progressed, these higher concentrations in leachates typically decreased to lower single-digit levels prior to final harvest on day 228.

Breakthrough of 2,6-DNT at quantifiable levels occurred in the same seven out of ten of the intact AAD soil treatment columns as those that had 2,4-DNT breakthrough. When breakthrough of 2,6-DNT occurred in this Clarksville-Fullerton stony (cherty) loam soil, it ranged from 28 to 70 days and averaged 46 days. Despite that 2,6-DNT was initially present at only 40% of the concentration of either 2,4-DNT or TNT in the top 1" (0-2.5 cm) of soil, the transport of 2,6-DNT throughout the treatment soil columns occurred relatively quickly. Concentration values of 2,6-DNT in leachates were generally greater than those for TNT, but somewhat lower than those for 2,4-DNT. Following 2,6-DNT breakthrough, concentrations (mg L^{-1}) in leachates typically increased to mid-single-digit values or higher, for sustained periods (weeks). As leaching progressed, these higher concentrations in leachates typically decreased to lower single-digit levels prior to final harvest on day 228.

Detectable but nonquantifiable "trace" levels of the TNT transformation products 2-amino-DNT (<0.14 mg L^{-1}) and 4-amino-DNT (<0.12 mg L^{-1}) were found in leachates from the AAD treatment soil columns. Seven of the ten treatment columns had trace levels of amino-DNTs that, once present in the leachate, were consistently detected at trace levels until the column was harvested. The first appearance of amino-DNTs in leachates was on day 7 for 2-amino-DNT, and for 4-amino-DNT on day 11; with the last "initial" appearance of 2-amino-DNT on day 77, and of 4-amino-DNT on day 73. In leachates from four of the seven treatment columns both amino-DNTs initially appeared on the same day, with the other three columns having spans of only 3, 4, and 7

days between initial appearance of the respective amino-DNTs in their leachates. The amounts of amino-DNTs found in leachates did not represent an appreciable fraction of the TNT added to the AAD soil columns.

Overall the amount of RDX recovered in leachates was substantial, yielding 17% (58 mg) recovered by 19.5 weeks (Table 4.3). Of the RDX that was recovered in leachates, almost all of this had leached through the soil 19.5 weeks with only minor additional amounts (3 mg; <1%) recovered thereafter. Overall the amount of TNT recovered in leachates was very low (Table 4.4), yielding a maximum recovery of only 0.4% (1.5 mg) at 19.5 weeks, with no additional recovery thereafter. Recoveries of 2,4- and 2,6-DNT in leachates were higher than that for TNT even though all are nitroaromatic compounds, but substantially lower than that of RDX, a cyclonitramine. The maximum amounts of 2,4-DNT and 2,6-DNT recovered from the leachates were 5% (18 mg) and 8% (11 mg) respectively (Tables 4.5 and 4.6), which occurred accumulatively at 32.5 weeks for both compounds at the final harvest of columns.

Table 4.3 RDX Recovered (Avg. of Duplicates) in Leachates and Soil*, as a Function of Time After Commencing Leaching.

RDX	Weeks.........	6.5	13	19.5	26	32.5
Amount added in spike	(mg)	350	350	350	350	350
Recovered in leachate	(mg)	14	39	58	60	61
Percent of added spike		4%	11%	17%	17%	17%
Recovered in soil	(mg)	389	280	246	135	151
Percent of added spike		111%	80%	70%	38%	43%
Total recovered	(mg)	403	319	304	195	212
Percent of added spike		115%	91%	87%	56%	60%

* Intact soil-core columns of Clarksville-Fullerton stony/cherty loam soil from AAD.

Table 4.4 TNT Recovered (Avg. of Duplicates) in Leachates and Soil*, as a Function of Time After Commencing Leaching.

TNT Weeks.........	6.5	13	19.5	26	32.5
Amount added in spike (mg)	350	350	350	350	350
Recovered in leachate (mg)	0.4	0.8	1.5	1.5	1.5
Percent of added spike	0.1%	0.2%	0.4%	0.4%	0.4%
Recovered in soil (mg)	135	57	52	8	10
Percent of added spike	39%	16%	15%	2%	3%
Total recovered (mg)	135	58	54	9	12
Percent of added spike	39%	17%	15%	3%	3%

* Intact soil-core columns of Clarksville-Fullerton stony/cherty loam soil from AAD.

Table 4.5 2,4-DNT Recovered (Avg. of Duplicates) in Leachates and Soil*, as a Function of Time After Commencing Leaching.

2,4-DNT Weeks.........	6.5	13	19.5	26	32.5
Amount added in spike (mg)	350	350	350	350	350
Recovered in leachate (mg)	0.6	3	7	12	18
Percent of added spike	0.2%	0.9%	2%	3%	5%
Recovered in soil (mg)	113	83	89	76	62
Percent of added spike	32%	24%	25%	22%	18%
Total recovered (mg)	114	86	96	88	78
Percent of added spike	32%	25%	27%	25%	22%

* Intact soil-core columns of Clarksville-Fullerton stony/cherty loam soil from AAD.

Table 4.6 2,6-DNT Recovered (Avg. of Duplicates) in Leachates and Soil*, as a Function of Time After Commencing Leaching.

2,6-DNT Weeks.........	6.5	13	19.5	26	32.5
Amount added in spike (mg)	140	140	140	140	140
Recovered in leachate (mg)	0.2	1	3	7	11
Percent of added spike	0.1%	1%	2%	5%	8%
Recovered in soil (mg)	26	17	26	21	18
Percent of added spike	19%	12%	19%	15%	13%
Total recovered (mg)	26	18	29	28	29
Percent of added spike	19%	13%	21%	20%	21%

* Intact soil-core columns of Clarksville-Fullerton stony/cherty loam soil from AAD.

The soil and explosives mixture, 1" (2.5 cm) of which was applied to the top of each treatment soil column of Clarksville-Fullerton stony/cherty loam from AAD, initially contained 1000 mg kg^{-1} (ppm) each of RDX, TNT, and 2,4-DNT, and 400 mg kg^{-1} 2,6-DNT. RDX was transported through the soil so quickly by leaching that it was found throughout the top 6" (0-15 cm) at the first soil sampling period, 6.5 weeks after leaching commenced. The concentration of RDX in the top 1" (0-2.5 cm) of the soil declined over time as RDX was transported through the soil in leachate, with concomitant increases in RDX concentrations at greater depths (Figures 4.1-4.5). Overall, the concentrations of RDX recovered in soil decreased with increasing leaching, from complete recovery at 6.5 weeks to approximately 40% recovery by weeks 26 and 32.5 (Table 4.3). Since virtually all the leachable RDX had been transported and recovered by week 19.5, the decrease in RDX extracted from soil (from 70% at 19.5 weeks, to approximately 40% at weeks 26 and 32.5) was due to either fixation of a portion of the RDX within the soil or transformation to a form undetected by our HPLC methods. HMX (a contaminant of RDX) concentrations in soil followed a pattern very similar to that of RDX (Figures 4.1-4.5), except that HMX was found only in "trace" (<2.9 mg kg^{-1}) amounts below 3" (7.5 cm) depth. Generally, HMX concentrations in the top 2-3" (0-5 or 0-7.5 cm) of soil were an order of magnitude lower than those for RDX.

TNT (a nitroaromatic) was added within the soil-spike atop the intact AAD soil-cores in the same amount and concentration as RDX (a cyclonitramine). At 6.5 weeks, the

greatest concentrations of extractable TNT (315 $\pm$25 mg kg^{-1}, avg.) were found in the top 1" (0-2.5 cm) soil section. However, this extractable TNT in the top 1" (0-2.5 cm) of Clarksville-Fullerton stony/cherty loam soil at 6.5 weeks was one-third that of RDX; with both TNT and RDX having similar but lower concentrations from 1-4" (2.5-10 cm) depth (Figures 4.6 and 4.1). At 6.5 weeks, "trace" (<6.1 mg kg^{-1}) levels of TNT were found at 5-6" (10-15 cm) depth. Beyond 6.5 weeks, quantifiable levels of TNT were typically found only within the top 3" (0-7.5 cm) of soil. As leaching progressed the amounts of TNT extractable from soil declined quickly from 39% at 6.5 weeks to 15-16% at 13-19.5 weeks, followed by even more dramatic decline to 2-3% at 26-32.5 weeks. The substantial decreases in extractable TNT were not due to recovery of TNT in leachates (Table 4.4) nor likely due to transformation of TNT to other detectable compounds (such as the amino-DNTs present only in trace amounts in leachates and in soil), but were most likely the result of fixation by the soil of TNT (or an unknown transformation product) presumeably within the top 6" (0-15 cm) of the soil.[32,33] The small amounts of TNT that did make its way into leachate may have been present either 1) due to mass action during initial inequilibrium that exisited at the commencement of leaching of the spiked soil (as would occur whenever TNT enters soil as a pollutant) or 2) eluting in a pulse in association with other soluble organic matter. In either case, it is interesting that the bulk of the TNT became fixed within the soil due to simulated weathering (exposure to moisture/leaching, with alternating wetting and drying cycles), as evidenced by the extractability of unweathered TNT from soil.

The DNTs (2,4-DNT and 2,6-DNT), both nitroaromatics like TNT, were added within the soil-spike atop the intact AAD soil-cores. The 2,4-DNT was added at 1000 mg kg^{-1}, in the same amount and concentration as TNT, while the 2,6-DNT was added at 400 mg kg^{-1}. Generally, the patterns of concentrations in soil of the DNTs over time as leaching progressed were similar, however at the same depths the concentration values were always less for 2,6-DNT than those for 2,4-DNT (Figures 4.6-4.10). At 6.5 weeks, the greatest concentrations of extractable DNTs were found in the second 1" (2.5-5 cm) soil section (Figure 4.6); with quantifiable levels of 2,4-DNT extending to 6" (15 cm) depth and 2,6-DNT to 5" (12.5 cm). By 6.5 weeks, both DNTs had established a moving peak-profile of their respective compounds within the soil; but only 0.2% of the 2,4-DNT and 0.1% of the 2,6-DNT were recovered in leachates. Both DNTs were more mobile than TNT; furthermore from 13 weeks onward, the peak concentration of extractable 2,4-DNT in soil exceeded that of TNT. Despite having this moderate level of mobility both DNTs were substantially fixed within the soil (analogous to TNT), with by far the greatest rate of fixation occurring between commencing of leaching and the first soil column harvest at 6.5 weeks. The overall recovery at 6.5 weeks was 32% for 2,4-DNT and 19% for

2,6-DNT (Table 4.5 and 4.6). Beyond 6.5 weeks, fixation of the DNTs within the soil slowed, and the accumulative recovery of 2,4-DNT in leachates increased over time. The increasing accumulative recoveries of the DNTs in leachates over time were higher than that for TNT, but lower than that for RDX (Tables 4.3-4.6). The resulting overall recoveries of the DNTs by 13, 19.5, 26, and 32.5 weeks were nearly constant, with values of 25, 27, 25 and 22% for 2,4-DNT and 13 (an anomalously low value), 21, 20, and 21% for 2,6-DNT. It is interesting that >65% of the 2,4-DNT and >75% of the 2,6-DNT quickly became fixed within the soil due to simulated weathering (exposure to moisture/leaching, with alternating wetting and drying cycles), as evidenced by the extractability of unweathered DNTs from soil. The DNTs closely followed the same overall pattern for recoveries, and both had similar concentration profiles in soil. The continued leaching of the moderately-mobile non-fixed portions of the respective DNTs within soil not only resulted in increasing recoveries of DNTs in leachates, but caused additional transport of the peak-profiles of both DNT compounds to greater depths over time (Figures 4.6-4.10).

5. AAD CONCLUSIONS

* **Intact Soil Column System: CESMU**

A state-of-the-art controlled environment soil-core microcosm unit (CESMU) system was developed to determine the transport and transformation of chemicals in AAD soil. The system used intact soil-core columns from the AAD OB/OD site. The major improvement of the CESMU system over existing microcosm technology was incorporation of a controlled weak vacuum to cause a continuous tension on the soil-core columns. This allowed study of chemical transport and transformation under laboratory conditions.

* **Explosives and Transformation Products in Leachates and Soil**

Concentrations of RDX, HMX, TNT, 2,4-DNT, and 2,6-DNT all occurred at detectable concentrations in leachates from treatment columns. Continuing breakthrough of RDX, TNT, 2,4-DNT and 2,6-DNT in leachates averaged day 12, 37, 34, and 46, respectively. Trace levels of 2-amino-DNT and 4-amino-DNT occurred in some AAD leachates. No other transformation products were found in AAD leachates.

In this Clarksville-Fullerton stony/cherty loam soil from the AAD site both RDX and HMX were very mobile, with RDX more mobile than HMX. RDX was completely recovered at 6.5 weeks of leaching, but by 19.5 weeks virtually all RDX that was available for leaching had already leached. By 13 weeks, continued weathering processes (i.e. alternating wetting and drying cycles, with the surface of the soil exposed to sunlight) were causing RDX to progressively become less available over time. This enhanced fixation of compounds due to weathering occurred much more quickly for the nitroaromatics TNT, 2,4-DNT, and 2,6-DNT than for the nitramine RDX; and occurred to the greatest extent for TNT. Traces of the TNT transformation products 2-amino-DNT and 4-amino-DNT were found in the soil.

* **Anthropogenic Elevation of Metal Levels in Soil**

Concentrations of all metals studied were higher in the contaminated than the uncontaminated Clarksville-Fullerton stony/cherty loam soil. Relative concentrations of metals in contaminated soil expressed as percentages of the values from uncontaminated background soil, and the determined concentration values (mg kg^{-1}) for the contaminated soil, were: Cd 350% (3.3), Cr 120% (7.2), Cu 7200% (122), Pb 190% (21.2), and Zn 720% (209). On the basis of the anthropogenic elevations alone, the greatest potential environmental hazard from metallic residues at PAD appears to be due to the elevated Cu, and Pb concentrations in OB/OD contaminated soil.

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APPENDIX A

QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

a. Analytical chemistry.

I. Analytical standards of explosives and related compounds were prepared by purification of existing USABRDL standards. Purification was accomplished by recrystallization in a water acetone system. A mixture of HMX, TNB, RDX, TNT, 2,6DNT, 2,4DNT, 2-Amino DNT, and 4-Amino DNT was prepared from analytical standards with each component at 100 ppm in acetonitrile. This mixture was sealed and stored at 2 to 5 degrees centigrade and used until expended (about six weeks).

II. The mixture was serially diluted with water or acetonitrile in a ten step process to yield calibration standards of 10, 5, 2.5, 1.25, 0.63, 0.32, 0.16, 0.08, 0.04, and 0.02 ppm. The standards were analyzed, peak areas recorded and a plot of concentrations/peak areas produced. Linear regression of this data in the form of $Y = MX + B$ with concentration as the dependent variable were calculated. This equation was used to calculate unknown concentrations from analyzed peak areas. New calibration standards were analyzed with each set of analytes run and the calibration curve recalculated.

III. Control samples to be analyzed with the test samples were prepared by diluting the multipart standard to 2.5 ppm with acetonitrile. Control samples were prepared in triplicate and analyzed with each batch of samples. The mean and standard deviation of these analyses were calculated and results from each analytical run plotted as scattergrams (Figures A1 to A9).

b. Extracts.

I. Soil columns were sectioned and soils ground and extracted in accordance with SOP and all extracts analyzed in triplicate. Quality assurance procedures were established to ascertain the efficiency of the extraction process. Uncontaminated soil samples were spiked after grinding with a mixture of the compounds under study and a percent recovery performed for each site (Table A1). Spiked samples were prepared in triplicate and analyzed with each batch of 27 soil extracts.

II. Dinitrobenzene (DNB) was added to the acetonitrile soil extraction solution as a means to provide an internal recovery standard for each soil sample analyzed. Separate samples containing only DNB and acetonitrile were analyzed in triplicate with each batch of soil extracts. Mean recovery and standard deviation of these samples were calculated as a check on extraction losses and analytical imprecision. These results are presented in Figure A10 .

c. Leachates.

Aqueous leachates were collected within the CESMU and removed for analysis. Samples were then refrigerated until analyzed. Leachates were not concentrated and recoveries were not corrected by internal standardization.

d. Measuring devices

Soils and explosives were weighed on scales of certified accuracy. Pipets were checked for accuracy when placed in service. Volumetric glassware was of certified accuracy.

e. Quality Assurance Categories for Investigation.

This investigation was initiated prior to the Toxicology Division SOP MGT-1 of 1 Oct. 91. However, this work meets the criteria of "Exploratory Research" in nature and is therefore classified as a Category 1 investigation. Good Laboratory Practices as applicable to this category of investigation, which were in place at the onset of work (Jan 1989), were followed throughout.

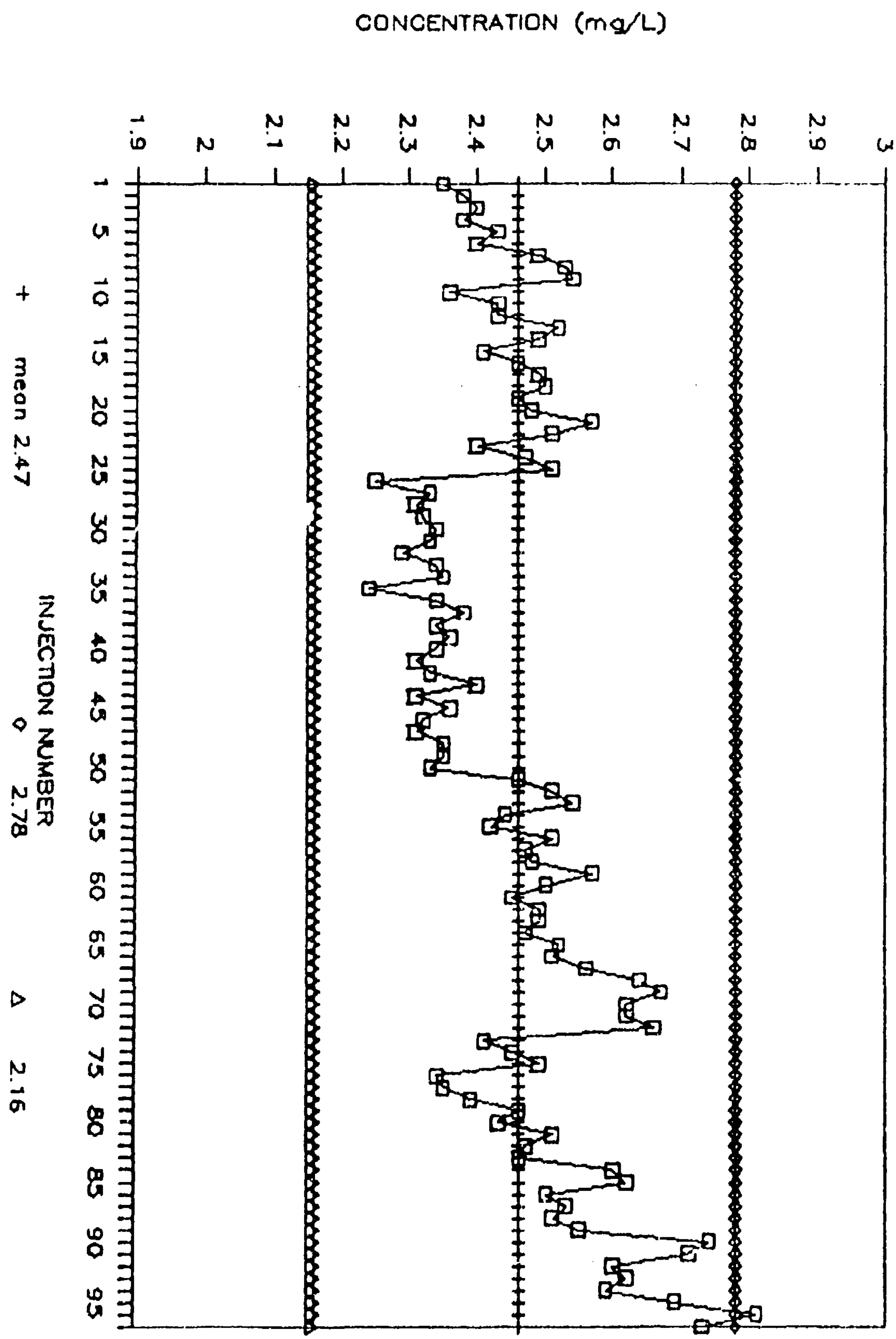
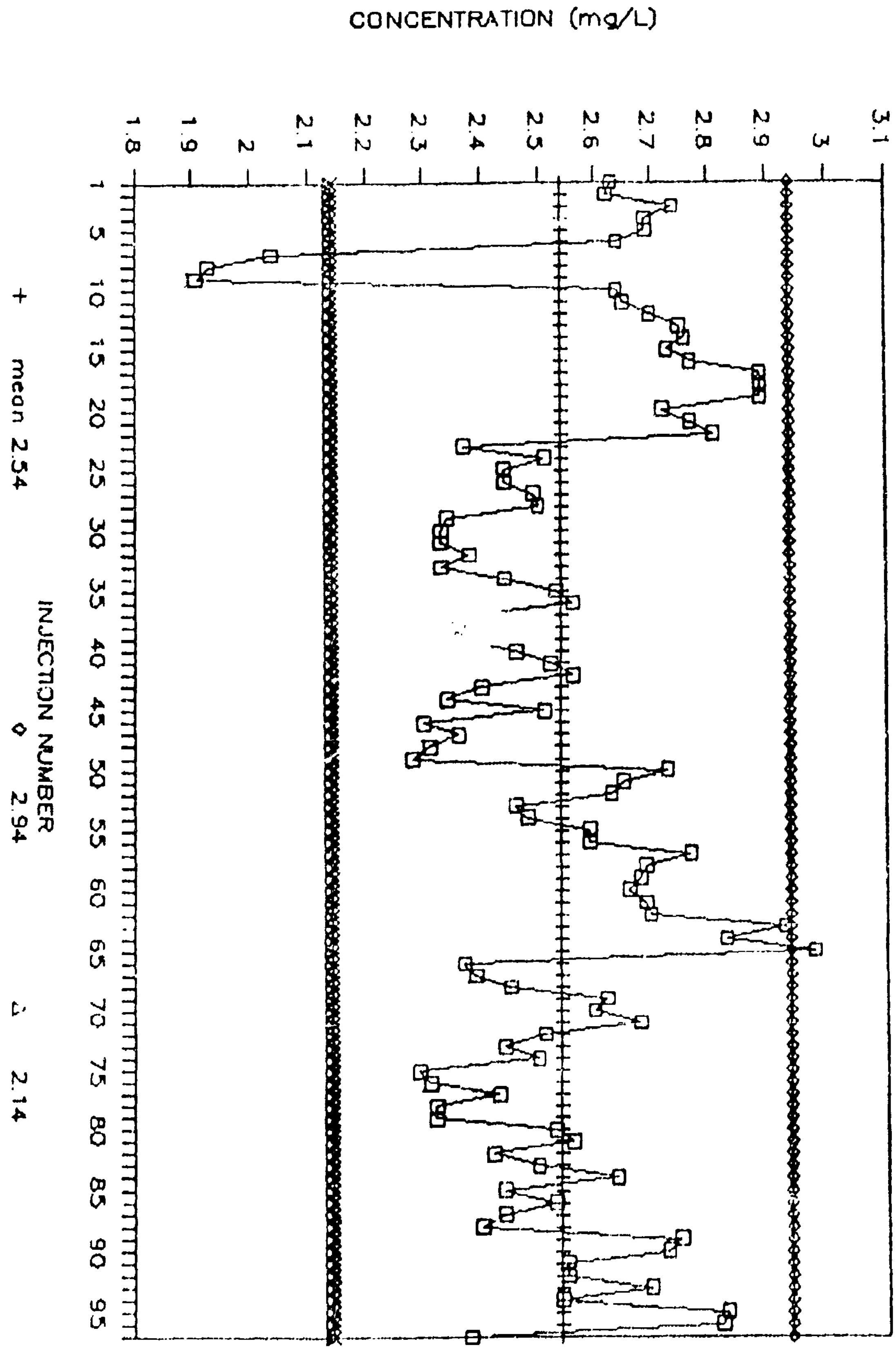


Fig. A1
HMX VARIABILITY IN THE MTPS

Appendix A

Fig. A2

TNB VARIABILITY IN THE MTPS



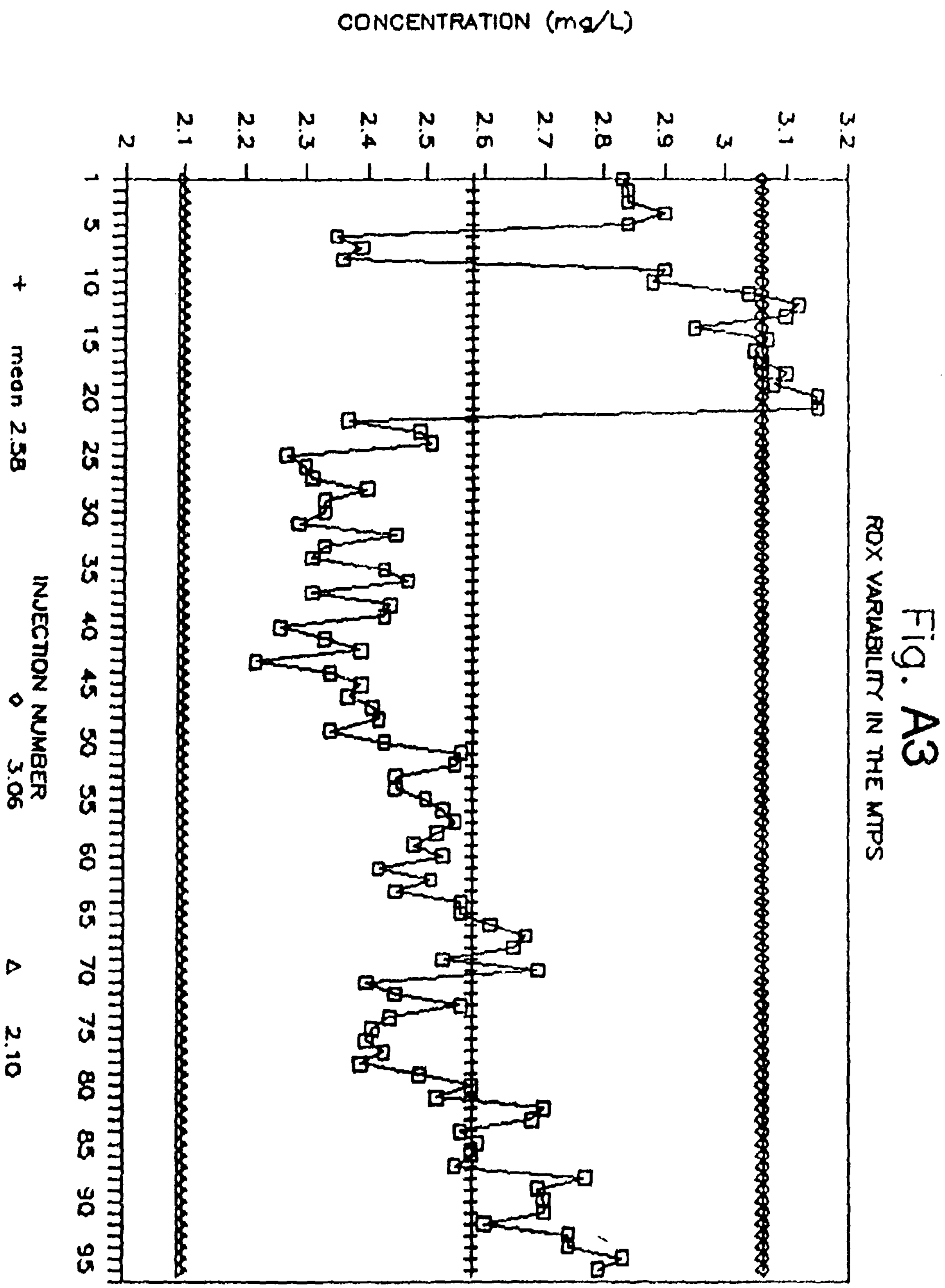


Fig. A3
RDX VARIABILITY IN THE MTPS
CONCENTRATION (mg/L)
INJECTION NUMBER
+ mean 2.58
◇ 3.06
△ 2.10

Appendix A

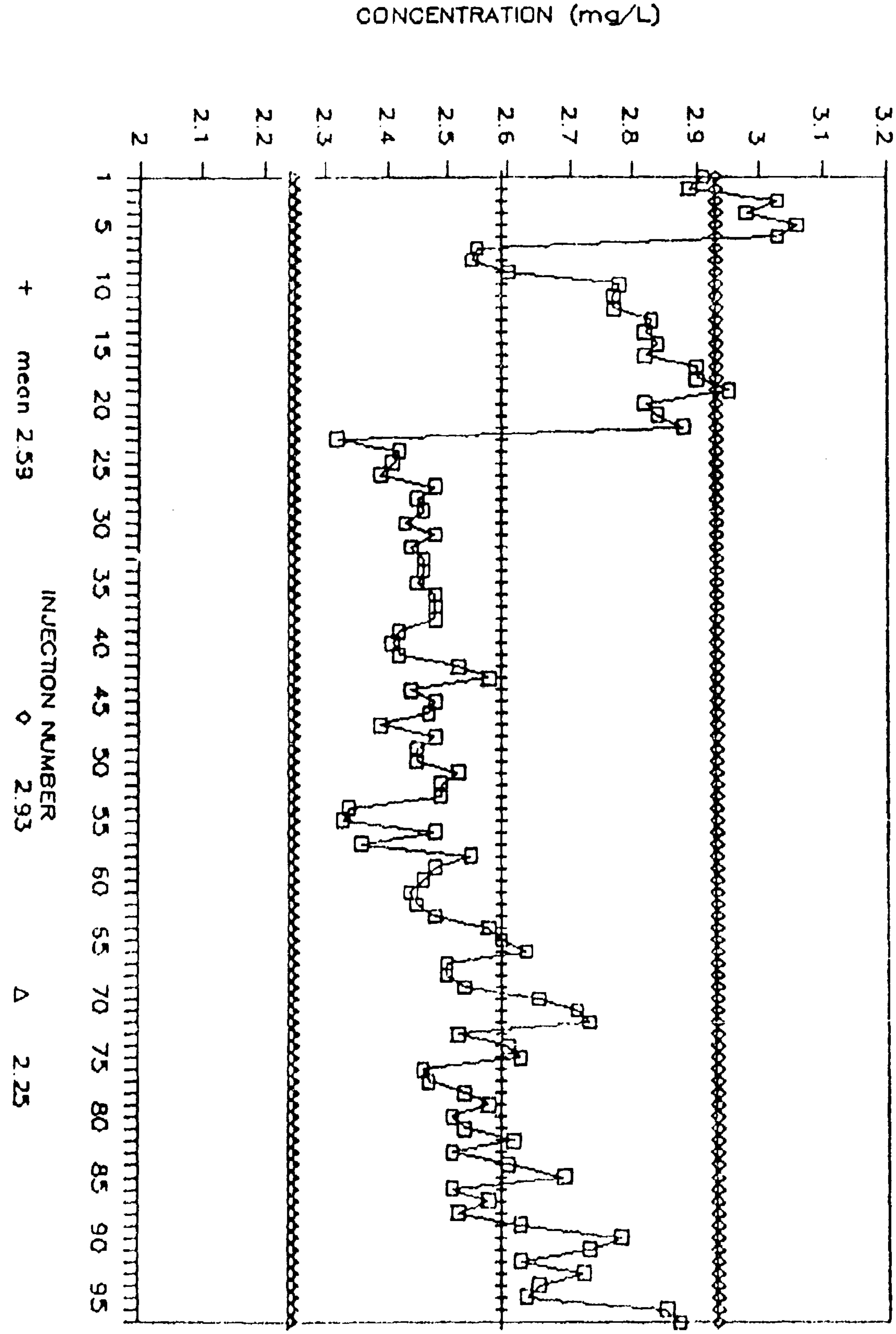
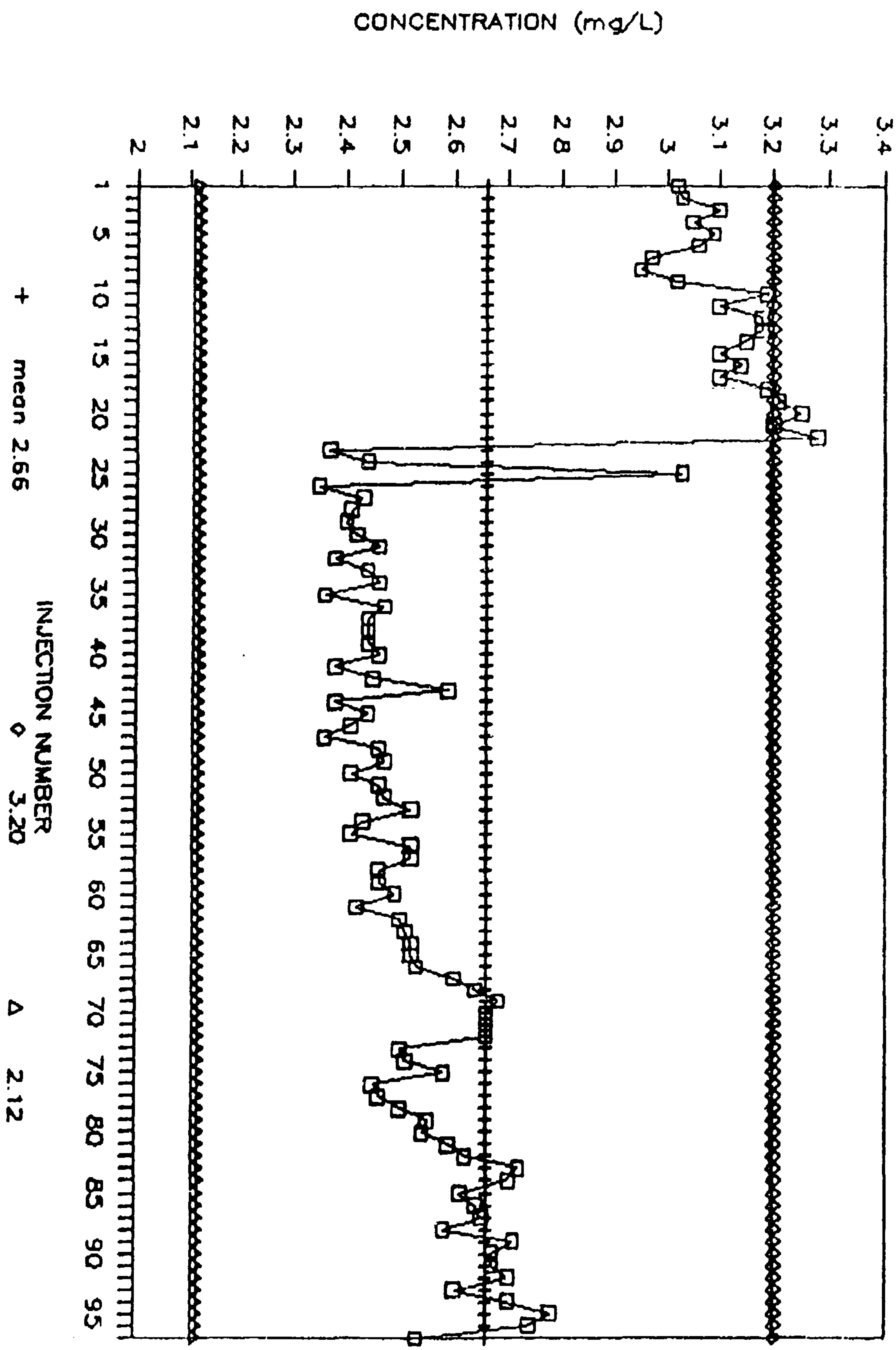


Fig. A4
TNT VARIABILITY IN THE MTPS

Appendix A

Fig. A5

2,4 DNT VARIABILITY IN THE MTPS



Appendix A

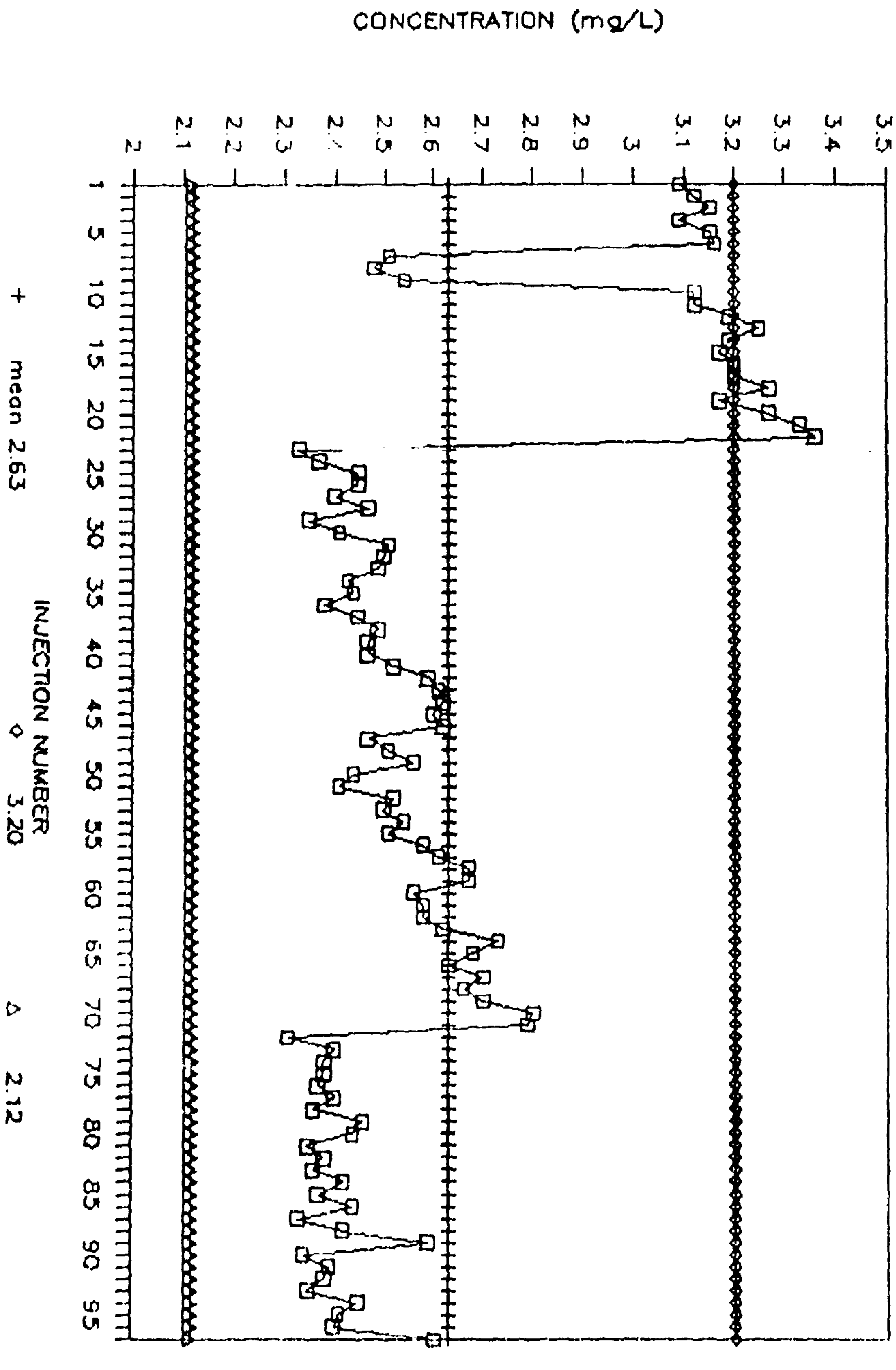


Fig. A6
2,6 DNT VARIABILITY IN THE MTPS

Appendix A

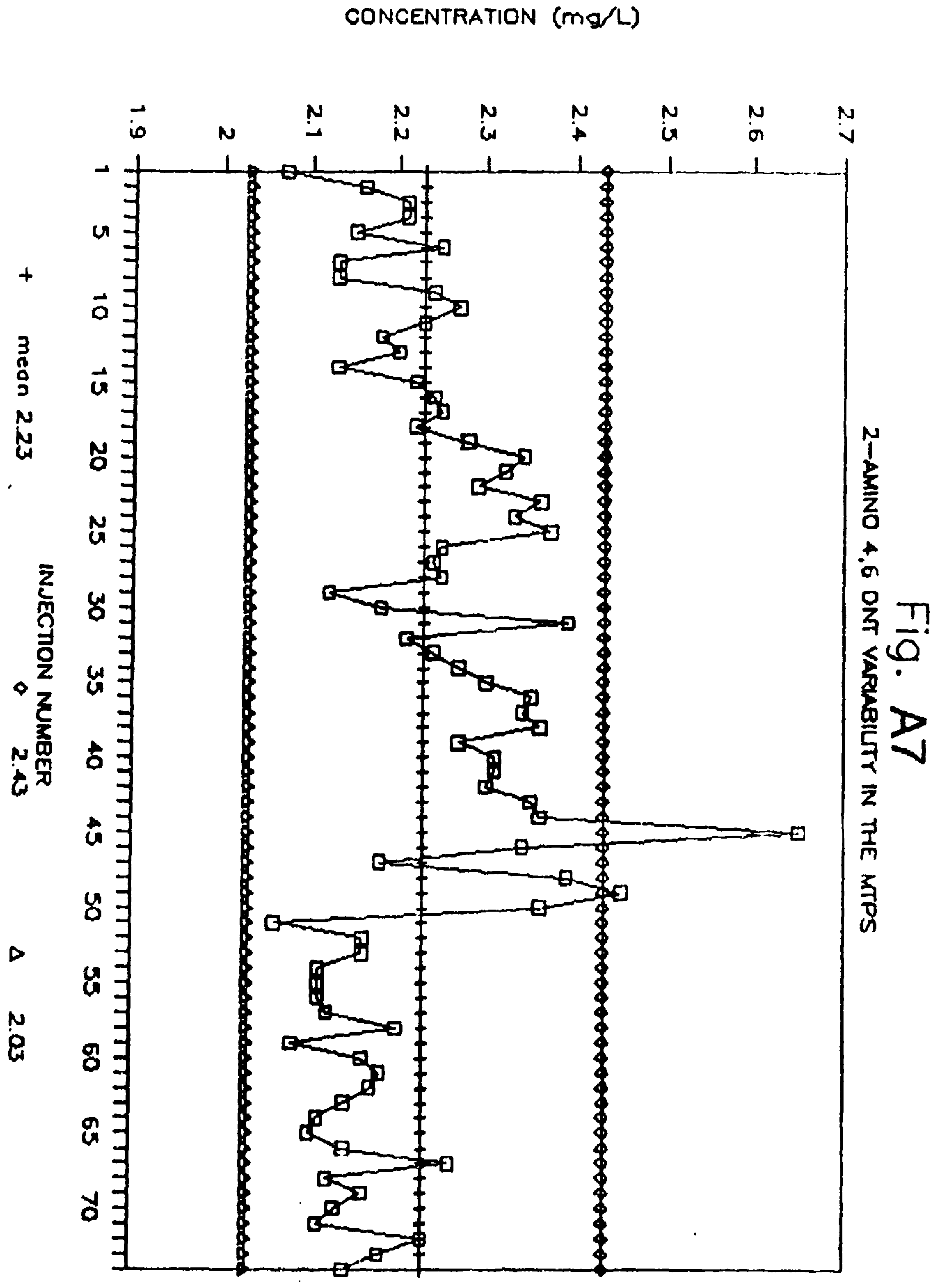
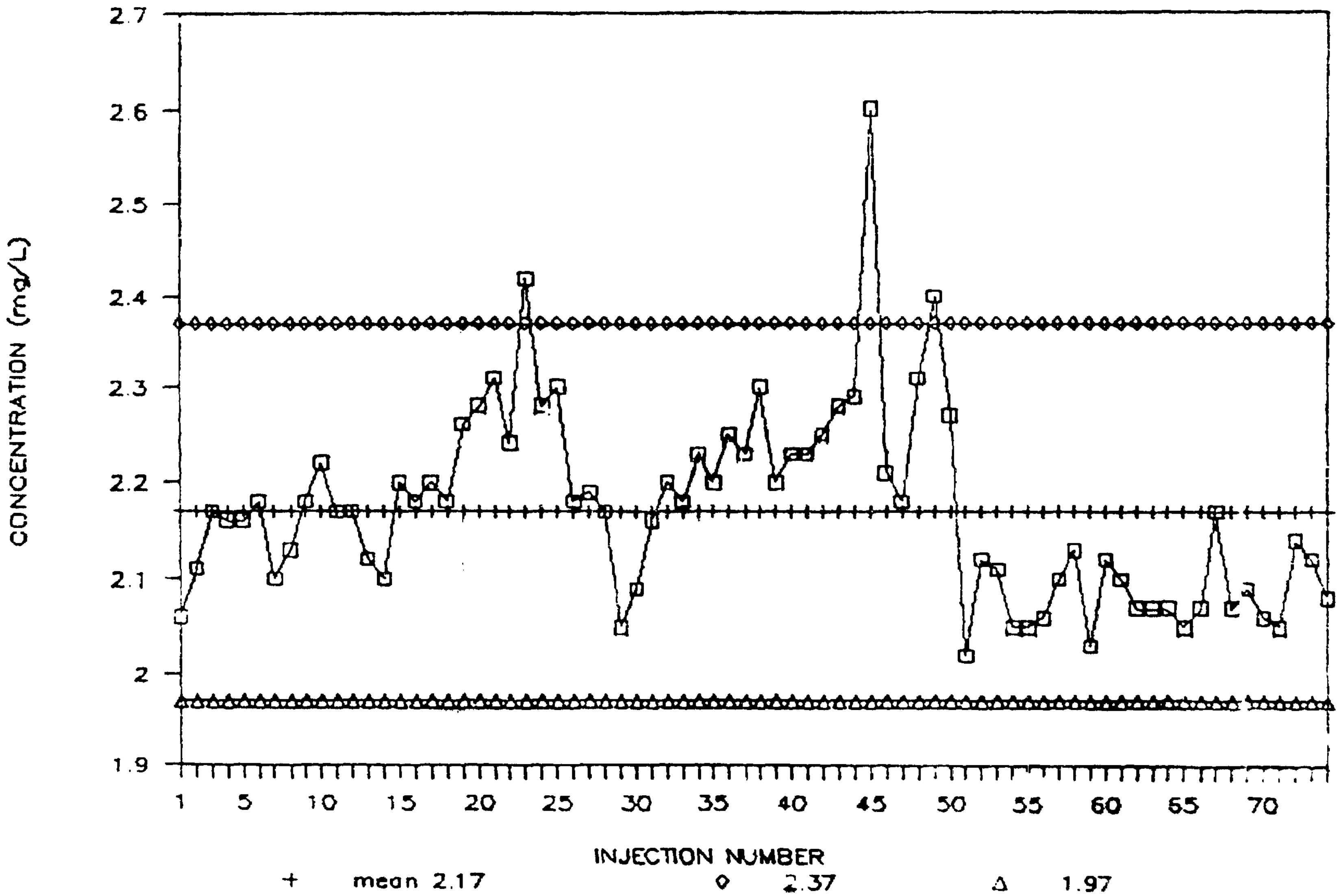


Fig. A7
2-AMINO 4,6 DNT VARIABILITY IN THE MTPS
CONCENTRATION (mg/L)
1.9
2
2.1
2.2
2.3
2.4
2.5
2.6
2.7
1
5
10
15
20
25
30
35
40
45
50
55
60
65
70
INJECTION NUMBER
+ mean 2.23
◇ 2.43
Δ 2.03

Appendix A

Fig. A8

4—AMINO 2,6 DNT VARIABILITY IN THE MTPS



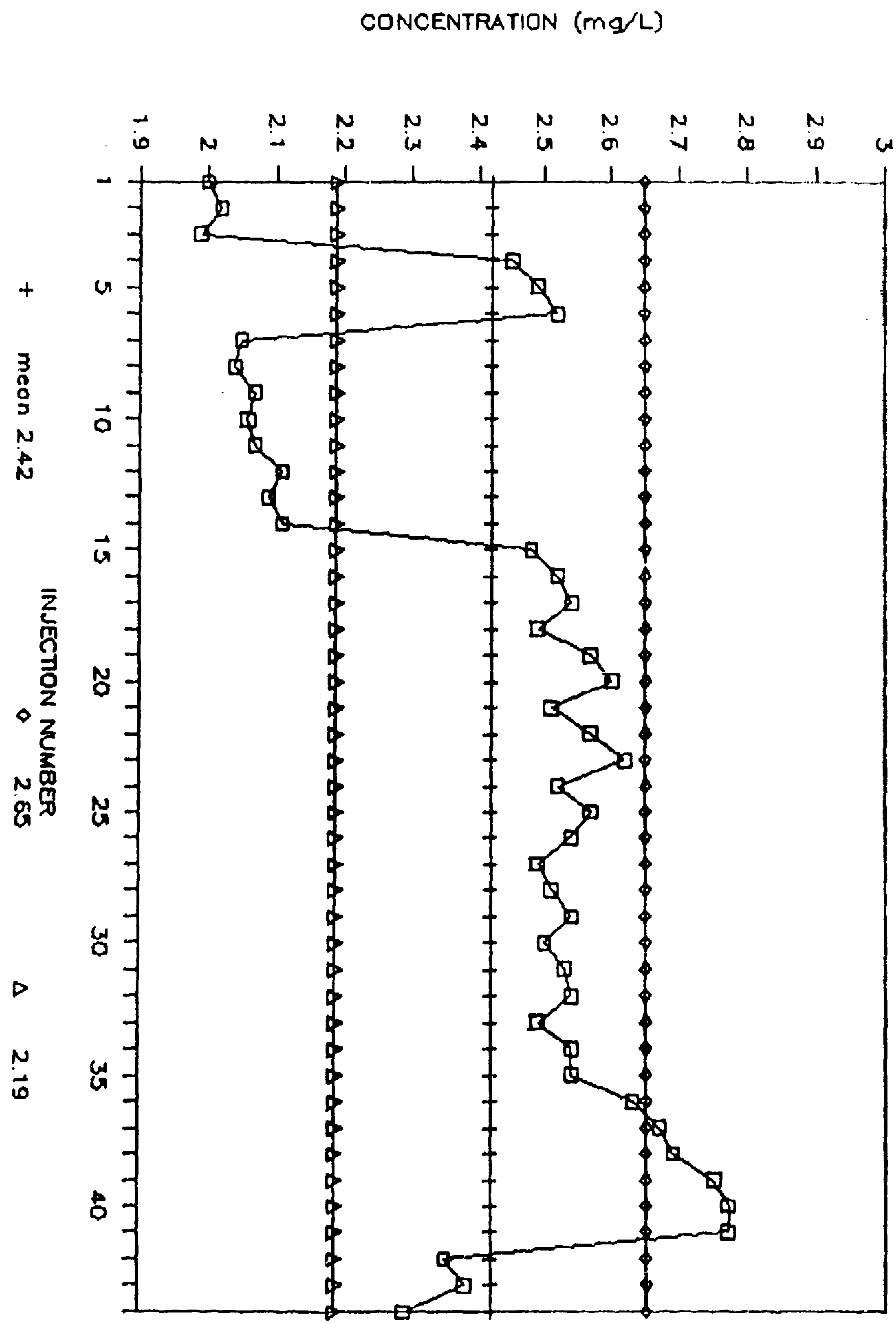


Fig. A9
DNB VARIABILITY IN THE MTPS

Appendix A

TABLE A1
PERCENT RECOVERY BY SITE

COMPOUND	RADFORD %RECOVERY	STD	MILAN %RECOVERY	STD
HMX	108.4	4.6	102.07	4.39
TNB	111.0	2.0	110.66	8.90
RDX	106.36	1.9	104.06	7.34
DNB	93.86	1.3	NONE	
TNT	99.60	1.2	108.91	6 74
2,4 DNT	103.46	1.3	107.24	6.84
2,6 DNT	100.96	1.9	107.02	8.81
2-AM 4,6 DNT	104.10	1.2	NONE	
4-AM 2,6 DNT	104.06	2.6	NONE	

COMPOUND	PUEBLO %RECOVERY	STD	ANNISTON %RECOVERY	STD
HMX	NONE		86.46	8.68
RDX	NONE		84.06	8.16
TNB	91.20	7.28	96.69	11.46
TNT	94.04	8.63	98.99	12.43
2,4 DNT	77.07	4.48	78.84	7.64
2,6 DNT	77.89	4.97	79.78	8.69
2-AM 4,6 DNT	67.63	14.43	73.48	21.87
4-AM 2,6 DNT	86.93	14.80	144.31	42.36

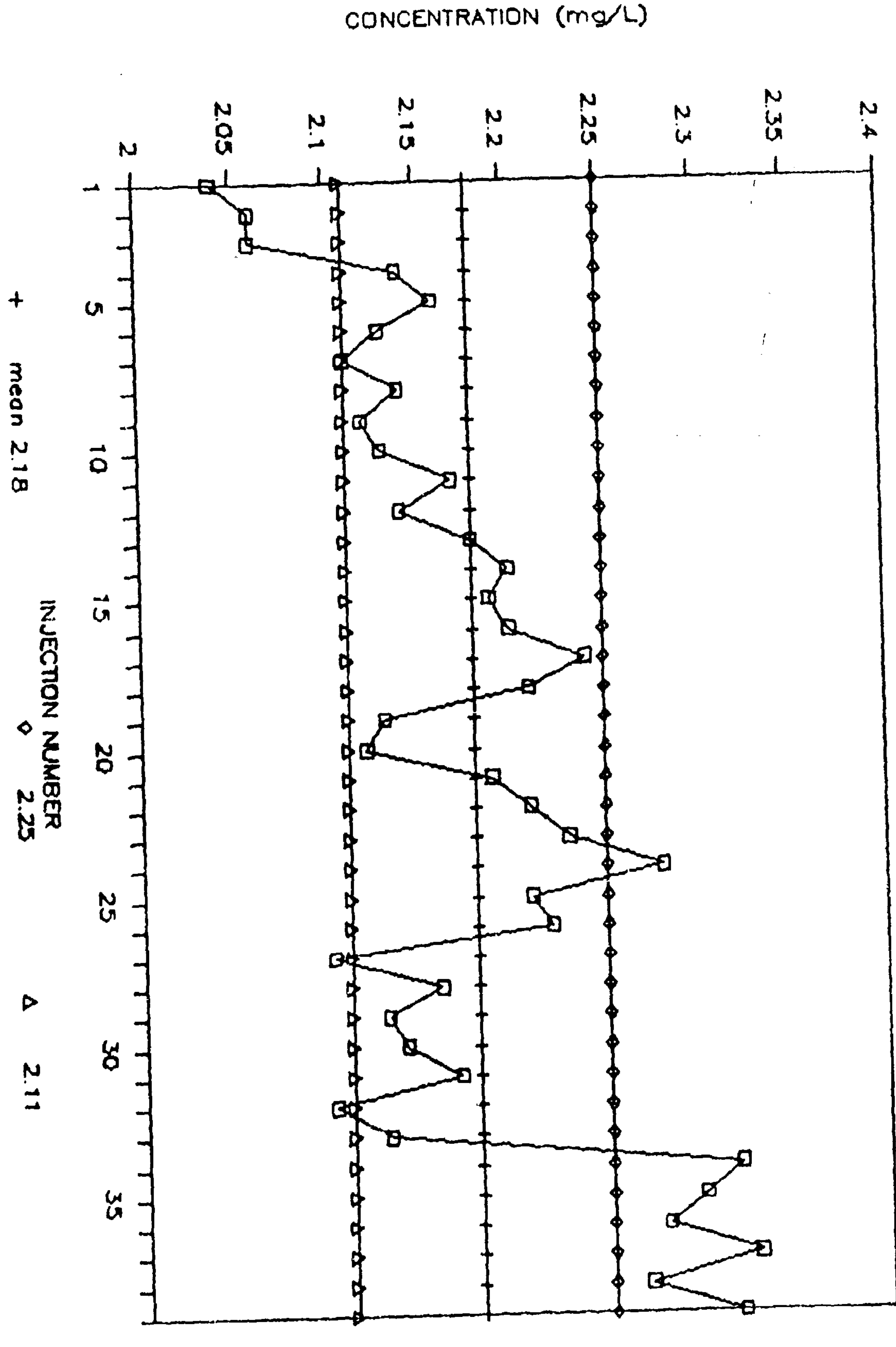


Fig. A10
DNB IN ACETONITRILE

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APPENDIX B

CRITERIA OF DETECTION

a. Explosives in Soil.

A criterion of detection (minimum accurate quantitation limit) was calculated from data of analysis of soil extracts in which the extraction and analysis steps were performed in triplicate and repeated in their entirety on four separate days. Criterion of detection of soil extracts was determined on a single soil type (Milan Soil). The soil was ground and subsamples were spiked with 0.0, 0.4, 0.8, 1.63, 3.13, 6.25, 12.5, 25, and 50 mg/kg of a mixture of HMX, TNB, RDX, TNT, 2,4-DNT, 2,6-DNT, 2-AM, and 4-AM. For purposes of calculation the concentration of the explosives spiked onto the soil was assumed to be the "target concentration" in the soil at the time of analysis. The soils were extracted in the manner used for samples and the extracts analyzed. Target concentrations and the analytically derived values of the replicates were entered into the USATHAMA program for calculation of criteria of detection (Tables F1 - F8). This program generates a two dimensional plot with found values (analytically derived) as the dependent variable and target concentration as the independent variable (Figures F1 - F8). Linear regression of this relationship produces an equation in the form $Y = mx + b$ with;

Y = the found concentration
b = the found concentration intercept
m = the slope of the line

The variance about the regression line is plotted, thus generating parallel lines above and below the regression line. At the point where the line representing the mean minus the variance contacts the ordinate, values of Y can no longer be reliably distinguished from zero (Figures F9 - F16). Thus, criterion of detection is defined as the lowest concentration of analyte in an environmental sample which can be reliably distinguished from zero. Results of criterion of detection of soil extraction studies are summarized in Table F9. The criterion of detection levels from soil are:

Compound	Criterion of Detection
HMX	2.9 mg/kg
TNB	2.4 mg/kg
RDX	5.8 mg/kg
DNT	6.1 mg/kg
2,4-DNT	5.7 mg/kg
2,6-DNT	5.2 mg/kg
2-AM	15.4 mg/kg
4-AM	14.6 mg/kg

b. Explosives in Leachates.

In addition to the work done with soil extracts, criterion of detection was also performed for the leachates. The criterion of detection for these samples corresponds to the quantitation limit of the instrument because no sample preparation steps were employed.

The multipart standard containing HMX, TNB, RDX, TNT, 2,4-DNT, 2,6-DNT, 2-AM, and 4-AM was prepared at 1000 mg/L. This solution was diluted in a serial fashion to yield concentrations of 10, 5, 2.5, 1.25, 0.63, 0.32, 0.16, 0.08, 0.04, and 0.02 mg/L. These concentrations were analyzed in triplicate on four separate days and the results used to calculate the criterion of detection for each compound. Two separate criterion of detection studies were completed for the aqueous leachates and data from both studies are presented. Data from the first and second iteration of this work are identified by the small letter "a and b" after the table or figure number. For purposes of calculation the concentration of the explosives spiked into solution was the "target concentration". Target concentrations and the analytically derived values of the replicates were entered into the USATHAMA program for calculation of criteria of detection (Tables F10 - F17). This program generates a two dimensional plot with found values (analytically derived) as the dependent variable and target concentrati [illegible] the independent variable (Figures F17 - F24). Linear reg[illegible]sion of this relationship produces an equation in the form $Y = mx + b$ with;

Y = the found concentration
b = the found concentration intercept
m = the slope of the line

The variance about the regression line is plotted, thus generating parallel lines above and below the regression line. At the point where the line representing the mean minus the variance contacts the ordinate, values of Y can no longer be reliably distinguished from zero (Figures F25 - F32). Thus, criterion of detection is defined as the lowest concentration of analyte in an environmental sample which can be reliably distinguished from zero. Results of criterion of detection of leachate studies are summarized in Table F18. The criterion of detection levels for water and solvent are:

Compound	Criterion of Detection
HMX	0.14 mg/L
TNB	0.14 mg/L
RDX	0.12 mg/L
DNB	0.15 mg/L
TNT	0.09 mg/L
2,4 DNT	0.17 mg/L
2,6 DNT	0.36 mg/L
2-AM	0.14 mg/L
4-AM	0.14 mg/L

Table F1

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	HMX	Analysis Date	03/18/92
		Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- · Model through the Origin ·

$Y = (-0.24876344) + (0.8542\text{[illegible]}00)X$ $\qquad Y = (0.846765184)X$

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	231.3894150	94	2.461589521	235.1184280	95	2.474930821
Total Error:	227.2558750	88	2.582453125	227.2558750	88	2.582453125
Lack of Fit:	4.133540000	6	0.688923333	7.862553000	7	1.123221857

LOF F-Ratio(F): 0.266770896   LOF F-Ratio(F): 0.434943754

Critical 95% F: 2.25   Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted   Calculated F: 1.514880108   Critical 95% F: 4

****

TABLE OF DATA POINTS   Targets: 8   Measures per Target: 12

	Target Value	Found Concentration				
1:	50	41.500000	43.200000	42.300000	45.600000	46.500000
		48.500000	40.400000	41.900000	42.400000	39.700000
		38.900000	39			
2:	25	20.900000	21.400000	21.200000	22.900000	22.700000
		23	21.700000	21.700000	21.800000	19.400000
		19.400000	19.500000			
3:	12.500000	10.700000	10.600000	10.300000	9.9400000	9.2600000
		12.500000	10.400000	10.300000	9.6000000	10
		14.300000	1.2000000			
4:	6.2500000	5.2000000	4.5400000	4.8000000	5	5.0900000
		5.1900000	5.1000000	4.8000000	5.1000000	5.1[illegible]00000
		4.9000000	4.9000000			

Table Fi (Cont.)

CERTIFICATION ANALYSIS   Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	HMX	Analysis Date	03/18/92
		Matrix:	SF

TABLE OF DATA POINTS   Targets: 8   Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	2 [illegible]0000	2.4800000	2.4800000	2.7000000	2 [illegible]
		2.[illegible]000	2.7700000	2.6700000	2.4800000	2.5000000
		2.5000000	2.6000000			
6:	1.5600000	1.1200000	1.9000000	1.2100000	1.0300000	1.2200000
		1.8000000	1.3200000	0.9300000	0.6400000	1.4000000
		1.1000000	0.9900000			
7:	0.8000000	0.8400000	0.7000000	0.6500000	0.6400000	0.7300000
		0.5400000	0.4400000	0.5400000	0.5400000	0.6400000
		0.2500000	0			
8:	0.4000000	0.4400000	0.6900000	0.6100000	0	0
		0	0	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F2

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	SOIL EXTRACTION		Units of Measure:	mg/Kg
Method Number:	1		Laboratory:	RW
Compound:	TNB		Analysis Date	03/18/92
			Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- : Y - (0.141512116) + (0.905973870)X

- Model through the Origin - : Y - (0.910203938)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	176.8768300	94	1.881668404	178.0835540	95	1.874563726
Total Error:	168.7549830	88	1.917670261	168.7549830	88	1.917670261
Lack of Fit:	8.121847000	6	1.353641167	9.328571000	7	1.332653000

LOF F-Ratio(F): 0.705877957 LOF F-Ratio(F): 0.694933340

Critical 95% F: 2.25 Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 0.641305342 Critical 95% F: 4

****

TABLE OF DATA POINTS Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
1:	50	45.600000	47.500000	46.100000	43.300000	43.800000
		51.600000	42	45.300000	46.100000	45.900000
		44.900000	45.400000			
2:	25	23	22.900000	22.900000	23.400000	23.500000
		23.500000	18.900000	21.300000	20.400000	23.900000
		23.700000	23.800000			
3:	12.500000	11.900000	11.700000	11.300000	10.900000	7.4700000
		5.6300000	12.900000	11.700000	11.200000	11.600000
		12	12.700000			
4:	6.2500000	5.9100000	5.9100000	6.0900000	5.7000000	5.3000000
		5.6800000	5.9100000	5.8600000	5.8000000	7
		7.2000000	6.8000000			

Table F2 (Cont.)

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name: SOIL EXTRACTION
Method Number: 1
Compound: TNB

Units of Measure: mg/Kg
Laboratory: RW
Analysis Date 03/18/92
Matrix: SF

TABLE OF DATA POINTS

Targets: 8

Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	4.2000000	4.2000000	4.1000000	3.0400000	3.0400000
		2.7500000	3.1000000	2.2900000	2.2300000	2.8600000
		2.9800000	2.9200000			
6:	1.5600000	1.4800000	1.4800000	1.5400000	1.5400000	0.8500000
		1.0800000	1.2000000	1.5400000	2.8000000	1.3700000
		2.3000000	2.9000000			
7:	0.8000000	0.2300000	0.2200000	0.2100000	0.6200000	0.6200000
		0.5600000	0.7900000	0.5100000	0.3300000	0.9100000
		0.9100000	0.7900000			
8:	0.4000000	0.2900000	2.6000000	2.6000000	2	2
		0	0	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F3

CERTIFICATION ANALYSIS Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	RDX	Analysis Date	03/18/92
		Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- $Y = (-0.11490761) + (0.744807248)X$

- Model through the Origin - $Y = (0.741372440)X$

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	703.3546070	94	7.482495819	704.1502500	95	7.412107895
Total Error:	684.0883830	88	7.773731625	684.0883830	88	7.773731625
Lack of Fit:	19.26622400	6	3.211037333	20.06186700	7	2.865981000

LOF F-Ratio(F): 0.413062540 LOF F-Ratio(F): 0.368675063

Critical 95% F: 2.25 Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 0.106333905 Critical 95% F: 4

****

TABLE OF DATA POINTS Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
1:	50	38.800000	39.900000	38.300000	25.900000	26.400000
		42.100000	39.700000	40.200000	40.020000	39.500000
		38.700000	38.700000			
2:	25	19.500000	19.800000	20.400000	19.500000	19.500000
		19.100000	6.2100000	12	11.500000	21.400000
		21.400000	21.100000			
3:	12.500000	10	10.100000	9.2500000	9.4000000	9.1000000
		2.4200000	11.700000	10.500000	10.100000	15.100000
		10.800000	10.800000			
4:	6.2500000	5.5000000	6	4.8000000	5	5.1500000
		4.8500000	4.6000000	4.6000000	4.2400000	4.4000000
		5.1500000	4.8500000			

Table F3 (Cont.)

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name: SOIL EXTRACTION
Method Number: 1
Compound: RDX

Units of Measure: mg/Kg
Laboratory: RW
Analysis Date 03/18/92
Matrix: SF

TABLE OF DATA POINTS Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	2.2700000	2.1200000	2.1200000	2.4000000	0.6100000
		0.7600000	2.1200000	2.2700000	2.4300000	2.2000000
		2.3000000	2.8000000			
6:	1.5600000	2	1.7000000	1.2000000	0.4500000	1.0600000
		1.0600000	0.4500000	0	0	0.6100000
		1.6700000	1.0600000			
7:	0.8000000	0	0	0	0	0
		0	0	0	1.3000000	1
		1.7000000	0.9200000			
8:	0.4000000	0.9000000	0	0	0	0
		0	0	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F4

CERTIFICATION ANALYSIS   Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	TNT	Analysis Date	03/19/92
		Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- : Y = (-0.03971536) + (0.884832944)X

- Model through the Origin - : Y = (0.883644807)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	1095.426110	94	11.65346926	1095.521060	95	11.53180063
Total Error:	1069.960770	88	12.15864511	1069.960770	88	12.15864511
Lack of Fit:	25.46534000	6	4.244223333	25.56029000	7	3.651470000

LOF F-Ratio(F): 0.349070418   LOF F-Ratio(F): 0.300318824
Critical 95% F: 2.25   Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted   Calculated F: 0.008147788   Critical 95% F: 4

****

TABLE OF DATA POINTS   Targets: 8   Measures per Target: 12

	Target Value	Found Concentration				
1:	50	50.600000	46.800000	51.200000	28.300000	27.200000
		56.700000	45.700000	47.700000	47.700000	40.200000
		41.300000	41.400000			
2:	25	20.700000	19.700000	20.600000	22.400000	23.700000
		23.100000	14.800000	25.500000	26.300000	24.600000
		23.800000	25.300000			
3:	12.500000	12.600000	10.800000	10.500000	13.200000	6.4400000
		10.400000	11.300000	12.300000	11.600000	14.100000
		13.700000	17.800000			
4:	6.2500000	8.3000000	3.7000000	7.7000000	5.7000000	5.6300000
		5.9200000	4.2000000	5	5.3400000	5.9200000
		5.5600000	5.5600000			

Table F4 (Cont.)

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name: SOIL EXTRACTION
Method Number: 1
Compound: TNT

Units of Measure: mg/Kg
Laboratory: RW
Analysis Date 03/19/92
Matrix: SF

TABLE OF DATA POINTS   Targets: 8   Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	2.1800000	2.7800000	2.7800000	2.2000000	1.5300000
		1.1600000	2.4800000	1.9700000	2.2600000	2
		2.1000000	1.8000000			
6:	1.6500000	1.2000000	1.4000000	1.5000000	1.8200000	1.5300000
		0.9400000	1.2400000	1.4600000	1.6000000	1.3100000
		0.9400000	0.9500000			
7:	0.8000000	0.2600000	0.6500000	0.5800000	0.5800000	0
		0	0	0	0	1
		0.7000000	0			
8:	0.4000000	0	0	0	0	0
		0	1.6500000	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F5

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	2,4DNT	Analysis Date	03/19/92
		Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- : Y = (-0.59402705) + (0.809804126)X

- Model through the Origin - : Y = (0.792047521)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	792.6388120	94	8.432327787	813.9022350	95	8.567391947
Total Error:	777.3167500	88	8.833144886	777.3167500	88	8.833144886
Lack of Fit:	15.32206200	6	2.553677000	36.58548500	7	5.226497857

LOF F-Ratio(F): 0.289101677   LOF F-Ratio(F): 0.591691676
Critical 95% F: 2.25   Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted   Calculated F: 2.521655175   Critical 95% F: 4

****

TABLE OF DATA POINTS   Targets: 8   Measures per Target: 12

	Target Value	Found Concentration				
1:	50	41.400000	40.200000	41.300000	40.200000	42.900000
		41.500000	26.700000	26.900000	43.200000	42.500000
		45.700000	46.400000			
2:	25	20.200000	21.200000	20.400000	12.500000	10.500000
		13.600000	23.700000	23.700000	23.900000	22.600000
		20.600000	19.700000			
3:	12.500000	12.100000	10.300000	16	10.200000	9.6200000
		9.4700000	9.4200000	6.4000000	6.7100000	11.400000
		11.800000	10.900000			
4:	6.2500000	4.5600000	4.8700000	5.3300000	2.9000000	5
		2.9500000	4.7100000	3.1800000	4.2500000	2.8000000
		3.4000000	3.2000000			

Table F5 (Cont.)

CERTIFICATION ANALYSIS | Report Date: 10/12/93

Method Name: SOIL EXTRACTION
Method Number: 1
Compound: 2,4DNT

Units of Measure: mg/Kg
Laboratory: RW
Analysis Date 03/19/92
Matrix: SF

TABLE OF DATA POINTS | Targets: 8 | Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	2	2.1000000	1.8000000	2.7200000	1.7200000
		2.4900000	1.9000000	1.0300000	1.0300000	1.2600000
		1.6400000	0.0300000			
6:	1.5600000	0.5700000	0.5700000	0.5700000	0	0
		0	0.2600000	0.4900000	0	1.4000000
		1.4000000	1.5000000			
7:	0.8000000	0	0	0.8000000	0	0
		0	0	0	0	0
		0	0			
8:	0.4000000	0	0	0	0	0
		0	0.9900000	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F6

CERTIFICATION ANALYSIS — Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	2,6DNT	Analysis Date	03/19/92
		Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- : Y = (-0.58428181) + (0.824346024)X

- Model through the Origin - : Y = (0.806880723)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	681.4978330	94	7.249976947	702.0693100	95	7.390203263
Total Error:	643.8581280	88	7.316569636	643.8581280	88	7.316569636
Lack of Fit:	37.63970500	6	6.273284167	58.21118200	7	8.315883143

LOF F-Ratio(F): 0.857407840 — LOF F-Ratio(F): 1.136582245

Critical 95% F: 2.25 — Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted — Calculated F: 2.837454126 — Critical 95% F: 4

****

TABLE OF DATA POINTS — Targets: 8 — Measures per Target: 12

	Target Value	Found Concentration				
1:	50	39.900000	31.400000	39.300000	44.300000	45.600000
		47.200000	42.843000	44.500000	39.500000	42.200000
		40.600000	24.600000			
2:	25	21.400000	21	20.400000	25.200000	24.100000
		24.200000	23.300000	22.400000	20.200000	20
		19.900000	14.500000			
3:	12.500000	10.900000	9.6200000	10.500000	9.8600000	6.6600000
		5.2400000	4.2900000	10.300000	11.700000	9.8600000
		11.100000	11.500000			
4:	6.2500000	2.8000000	3.4000000	3.2000000	4.4100000	5.1200000
		5.2400000	3.3000000	3.8000000	2.2700000	4.4100000
		4.7200000	4.5300000			

Table F6 (Cont.)

CERTIFICATION ANALYSIS   Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	2,6DNT	Analysis Date	03/19/92
		Matrix:	SF

TABLE OF DATA POINTS   Targets: 8   Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	3.1000000	1.2000000	2.6300000	1.3000000	0.3700000
		0.4900000	1.0800000	1.3200000	1.4400000	3
		2.9000000	0			
6:	1.5600000	1.9000000	2.2000000	1.7000000	0	0
		0	0	0.2500000	0.6100000	0
		0	0			
7:	0.8000000	1.2000000	0	2	1.8000000	0
		0	0	0	0	0
		0	0			
8:	0.4000000	0	0	0	1.8000000	0
		0	0	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F7

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	2-AM	Analysis Date	03/19/92
		Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- Y = (-0.73266610) + (0.786218675)X

- Model through the Origin - Y = (0.764317883)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	5512.399130	94	58.64254394	5544.746050	95	58.36574789
Total Error:	5418.396520	88	61.57268773	5418.396520	88	61.57268773
Lack of Fit:	94.00261000	6	15.66710167	126.3495300	7	18.04993286

LOF F-Ratio(F): 0.254448884 LOF F-Ratio(F): 0.293148367

Critical 95% F: 2.25 Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 0.551594761 Critical 95% F: 4

****

TABLE OF DATA POINTS Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
1:	50	60.400000	66.600000	70.400000	21	21.100000
		21.700000	35	47.500000	49.300000	17.400000
		18	24.100000			
2:	25	21.500000	15.300000	31.300000	38	33.400000
		13.500000	12.800000	12.500000	15.300000	16.400000
		18.300000	26.600000			
3:	12.500000	10.900000	10.500000	9.8600000	6.6600000	5.2400000
		4.2900000	10.300000	11.700000	9.8600000	7.6000000
		6.1000000	7.1000000			
4:	6.2500000	2.8000000	3.5000000	3.2000000	6.3500000	4.9400000
		1.2400000	4.7000000	4.3000000	2.3000000	3.8800000
		3.1800000	4.4100000			

Table F7 (Cont.)

CERTIFICATION ANALYSIS   Report Date: 10/12/93

Method Name: SOIL EXTRACTION
Method Number: 1
Compound: 2-AM

Units of Measure: mg/Kg
Laboratory: RW
Analysis Date 03/19/92
Matrix: SF

TABLE OF DATA POINTS   Targets: 8   Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	1.0600000	2.1200000	0.1800000	0.9000000	0.5400000
		0.3600000	1.0700000	1.7700000	1.6000000	1.6000000
		1.3000000	0			
6:	1.5600000	0.4000000	0.9000000	0.1000000	0.7000000	0
		0	0	0	0	0
		0	0			
7:	0.8000000	0	0	0	0	0
		0	0	0.3000000	0.1000000	0.6000000
		0	0			
8:	0.4000000	0	0	1.8200000	0	0
		0	0	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F8

CERTIFICATION ANALYSIS Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	4-AM	Analysis Date	03/19/92
		Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- Y = (-0.63682244) + (0.745388360)X

- Model through the Origin - Y = (0.726352519)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	4427.118830	94	47.09700883	4451.556370	95	46.85848811
Total Error:	4191.612510	88	47.63196034	4191.612510	88	47.63196034
Lack of Fit:	235.5063200	6	39.25105333	259.9438600	7	37.13483714

LOF F-Ratio(F): 0.824048665 LOF F-Ratio(F): 0.779620173
Critical 95% F: 2.25 Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 0.518876689 Critical 95% F: 4

****

TABLE OF DATA POINTS Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
1:	50	23	22.400000	25.600000	21.300000	37.600000
		35.600000	32.261000	6.4400000	67.600000	47.700000
		51.600000	47.700000			
2:	25	12.500000	13.100000	12.800000	12.800000	21.300000
		14.500000	19.800000	37.600000	35.600000	32.500000
		28.700000	16.100000			
3:	12.500000	9.9000000	8.3000000	7.7700000	9.1900000	6.5200000
		7.7700000	12.700000	15.800000	14.700000	7.1000000
		8.2000000	8.1000000			
4:	6.2500000	3.4000000	2.5000000	3.4000000	2.9700000	2.6200000
		2.7900000	3.1500000	2.9000000	1.9000000	3.1500000
		2.9700000	4.2100000			

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name: SOIL EXTRACTION
Method Number: 1
Compound: 4-AM

Units of Measure: mg/Kg
Laboratory: RW
Analysis Date 03/19/92
Matrix: SF

TABLE OF DATA POINTS   Targets: 8   Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	0.1300000	0	0.1300000	0	0
		0	0	0	0	0.7000000
		0.7000000	0.3400000			
6:	1.5600000	0	0	0	0	0
		0	0	0	0	0
		0	0			
7:	0.8000000	0	0	0	0	0
		0	0	0	0	0
		0	0			
8:	0.4000000	0	0	0	0	0
		0	0	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Figure F1

HMX

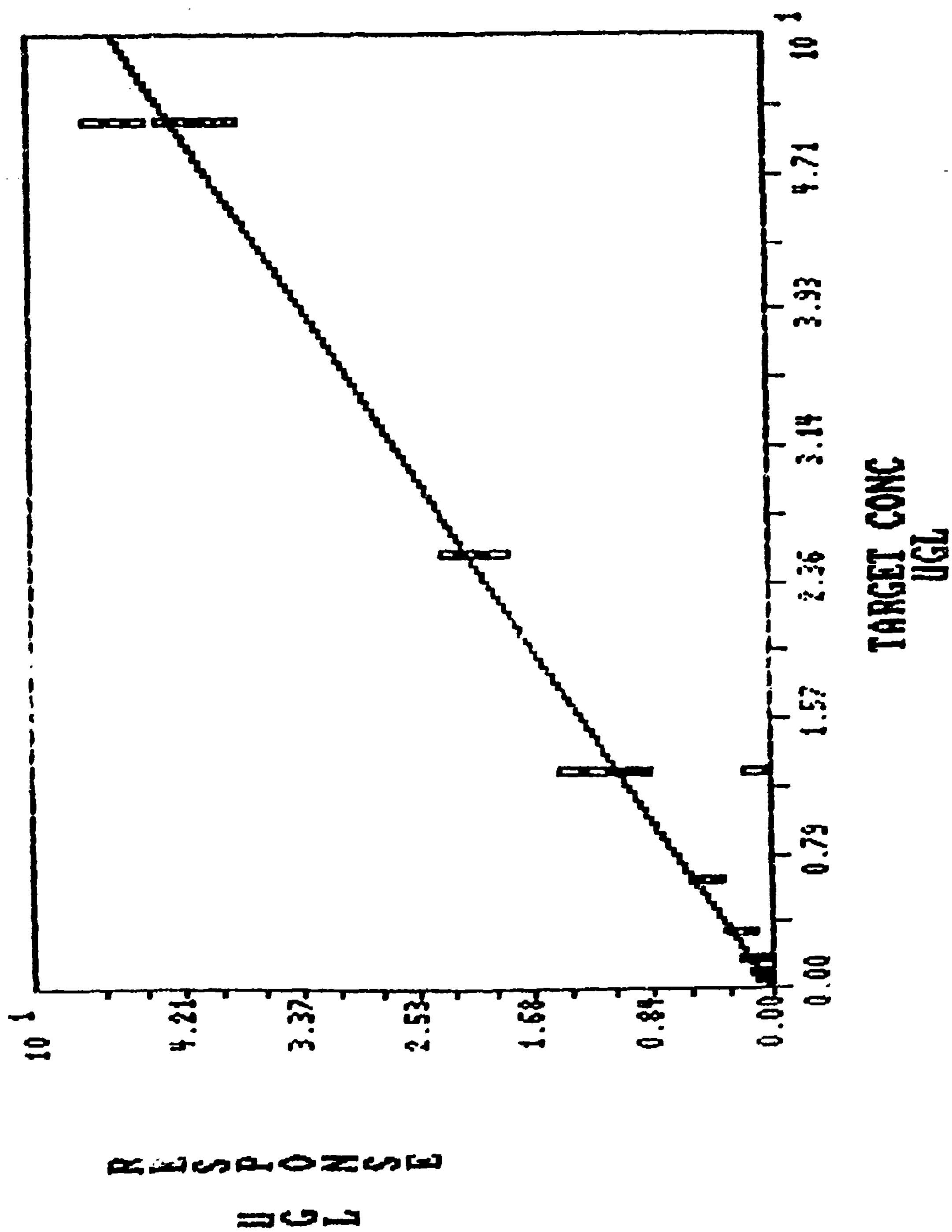


Figure F2

TNB

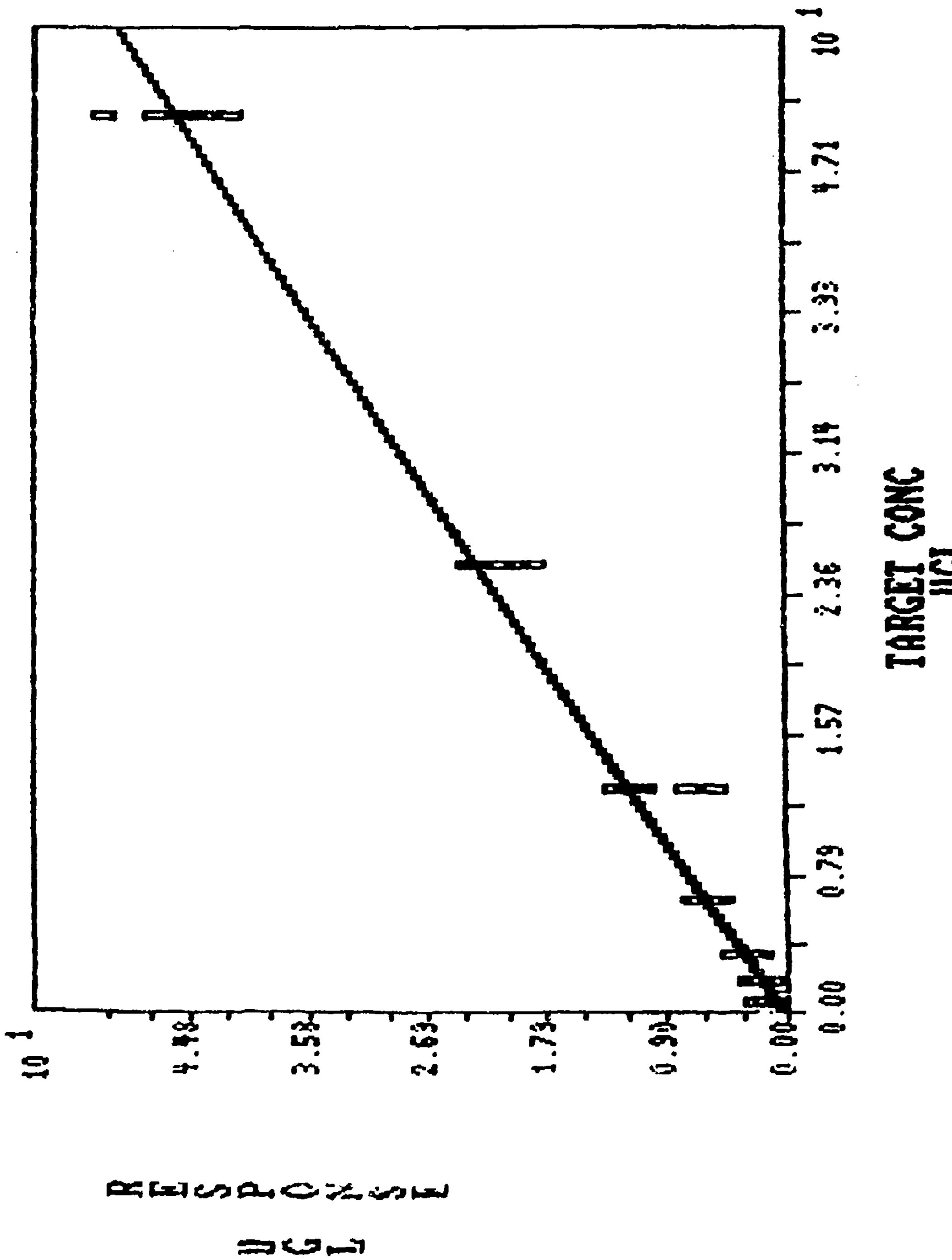


Figure F3

RDX

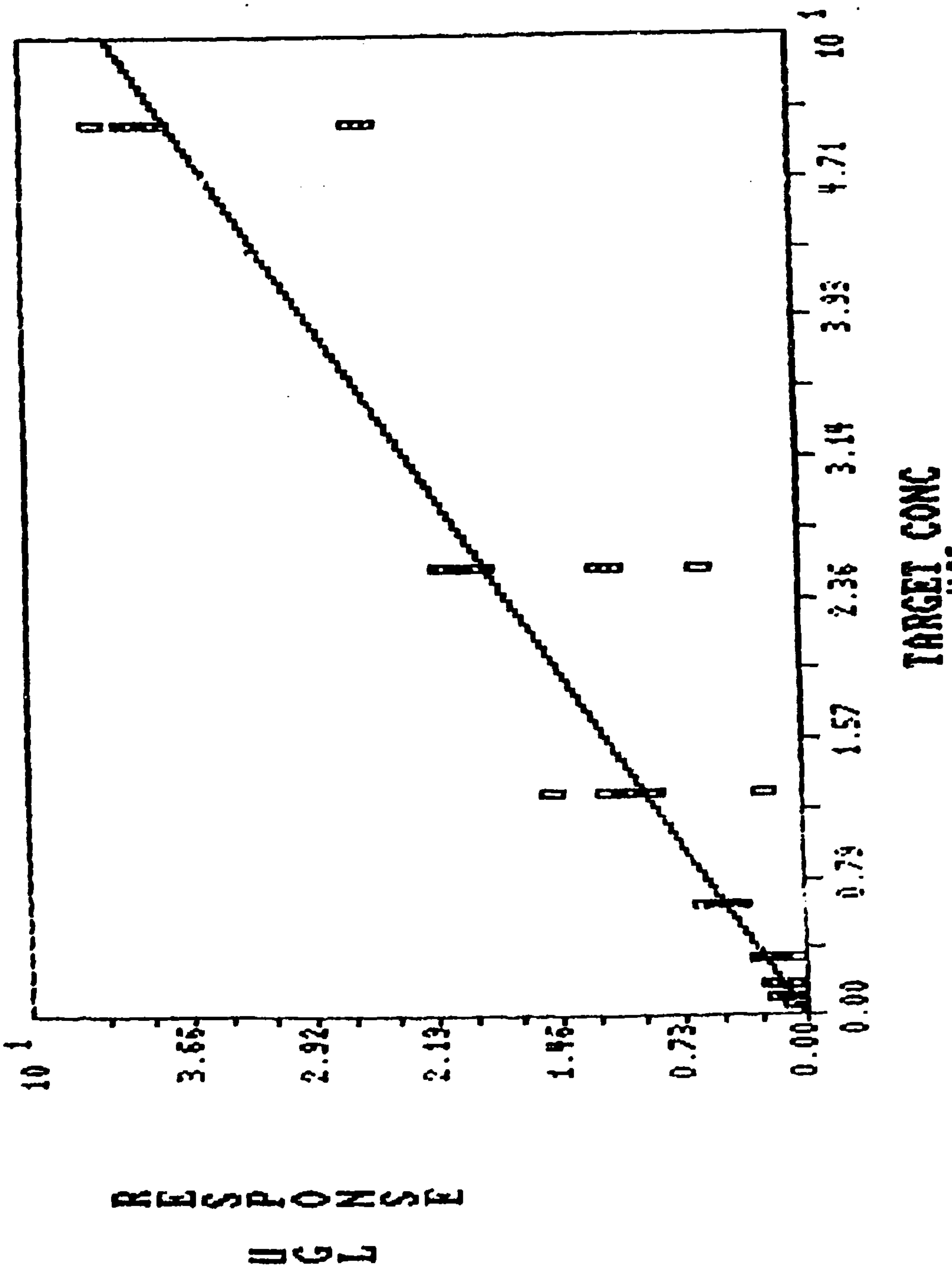


Figure F4

TNT

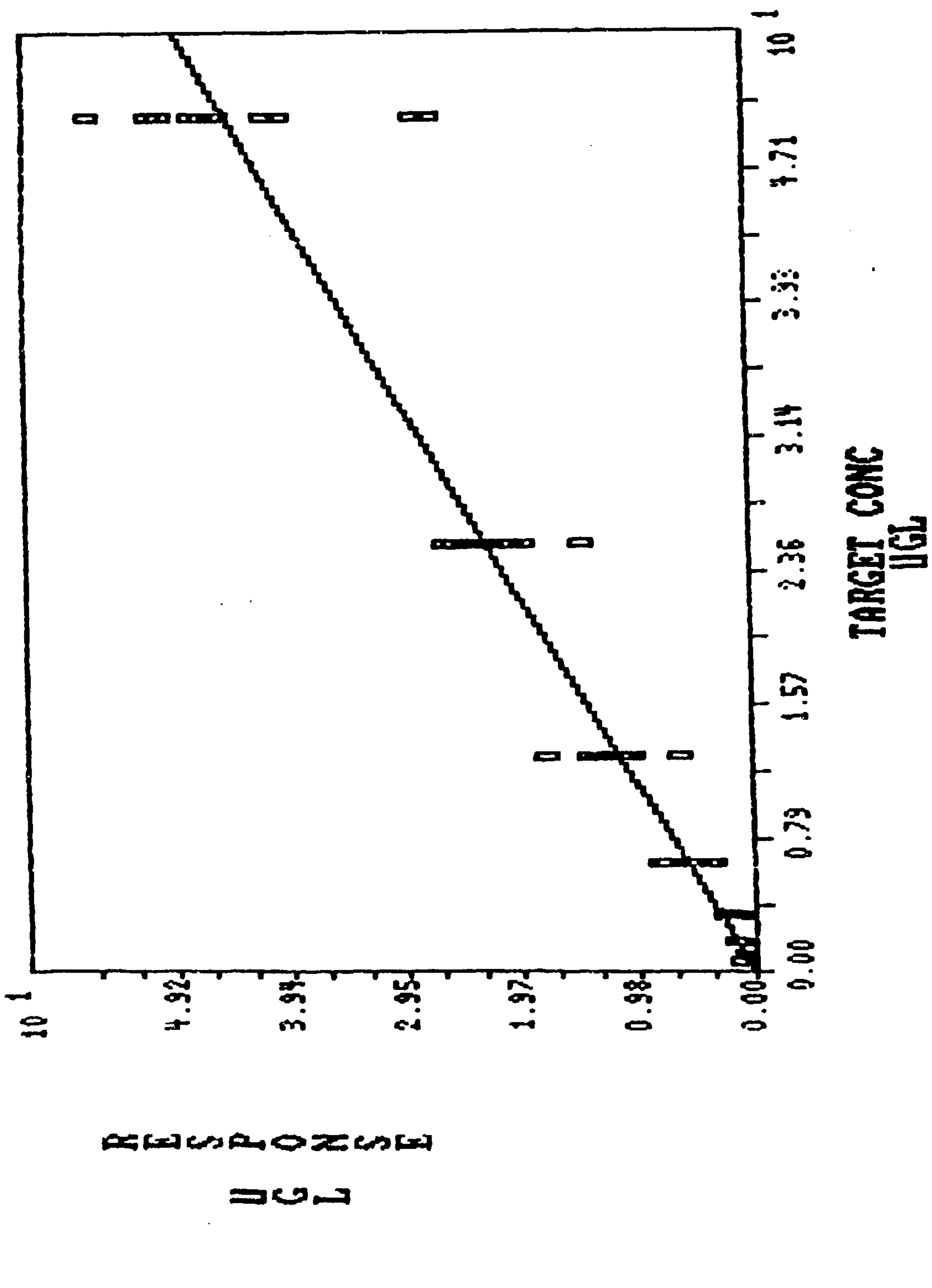


Figure F5

2,4DNT

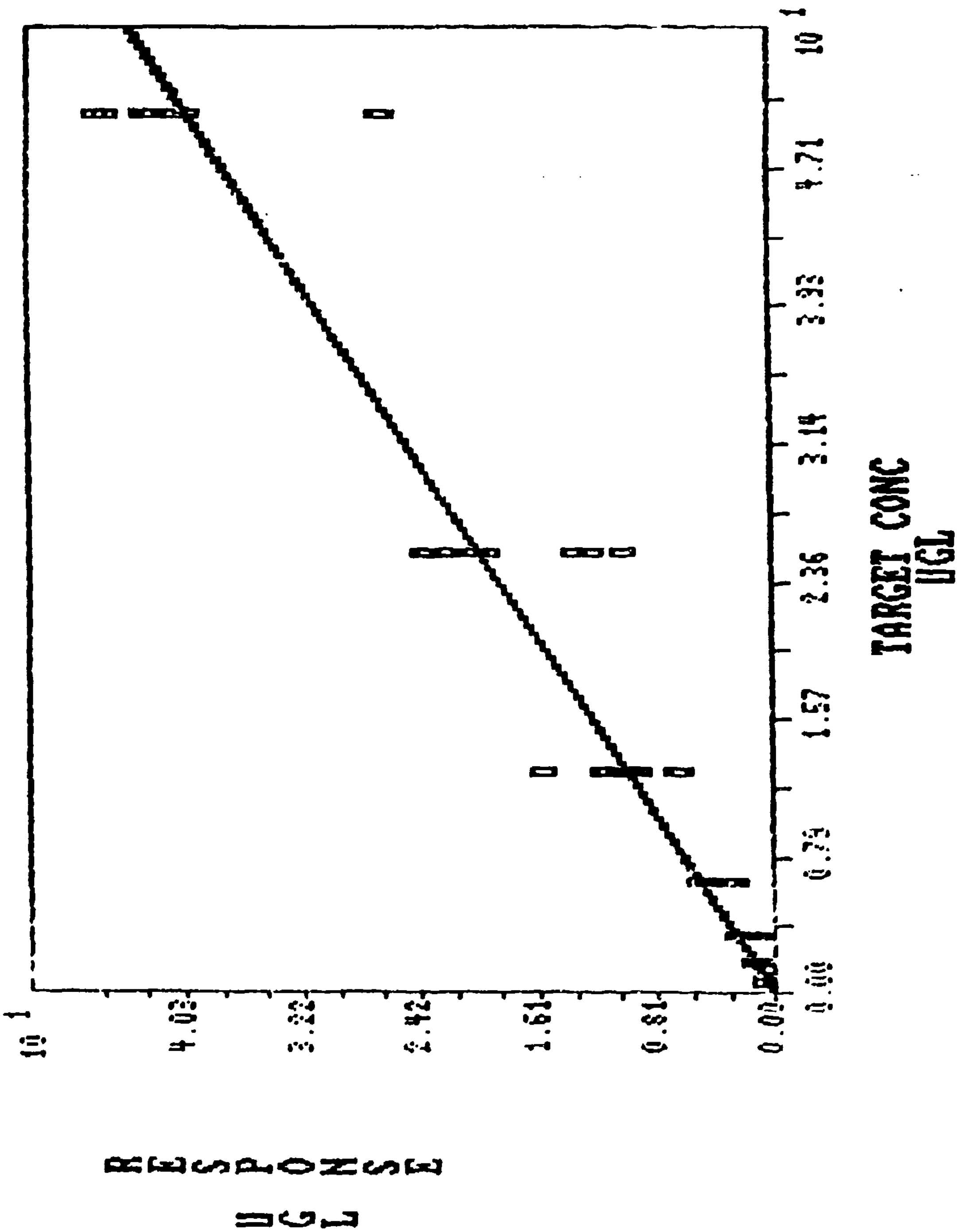


Figure F6

2,6DNT

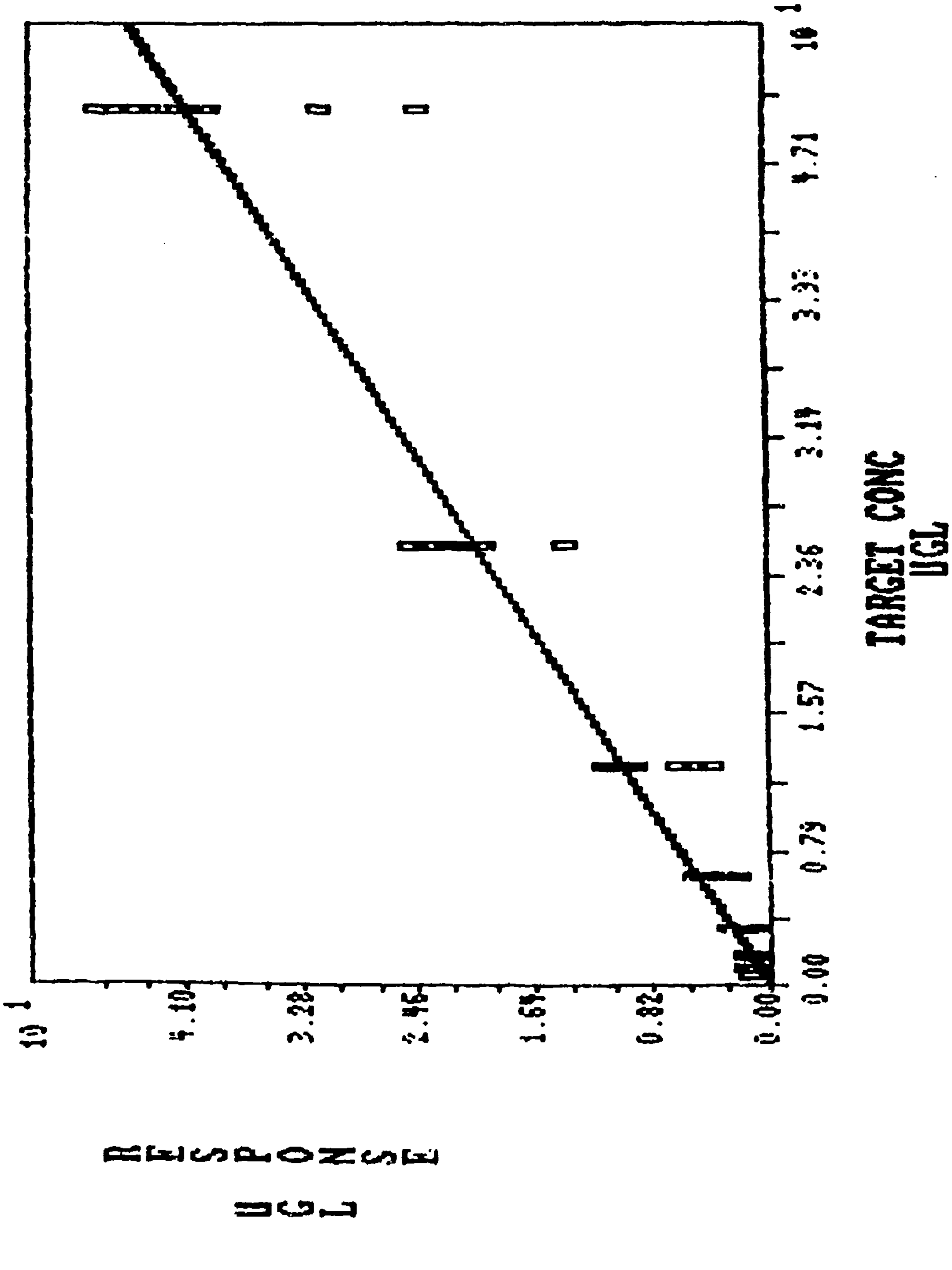


Figure F7

2-AM

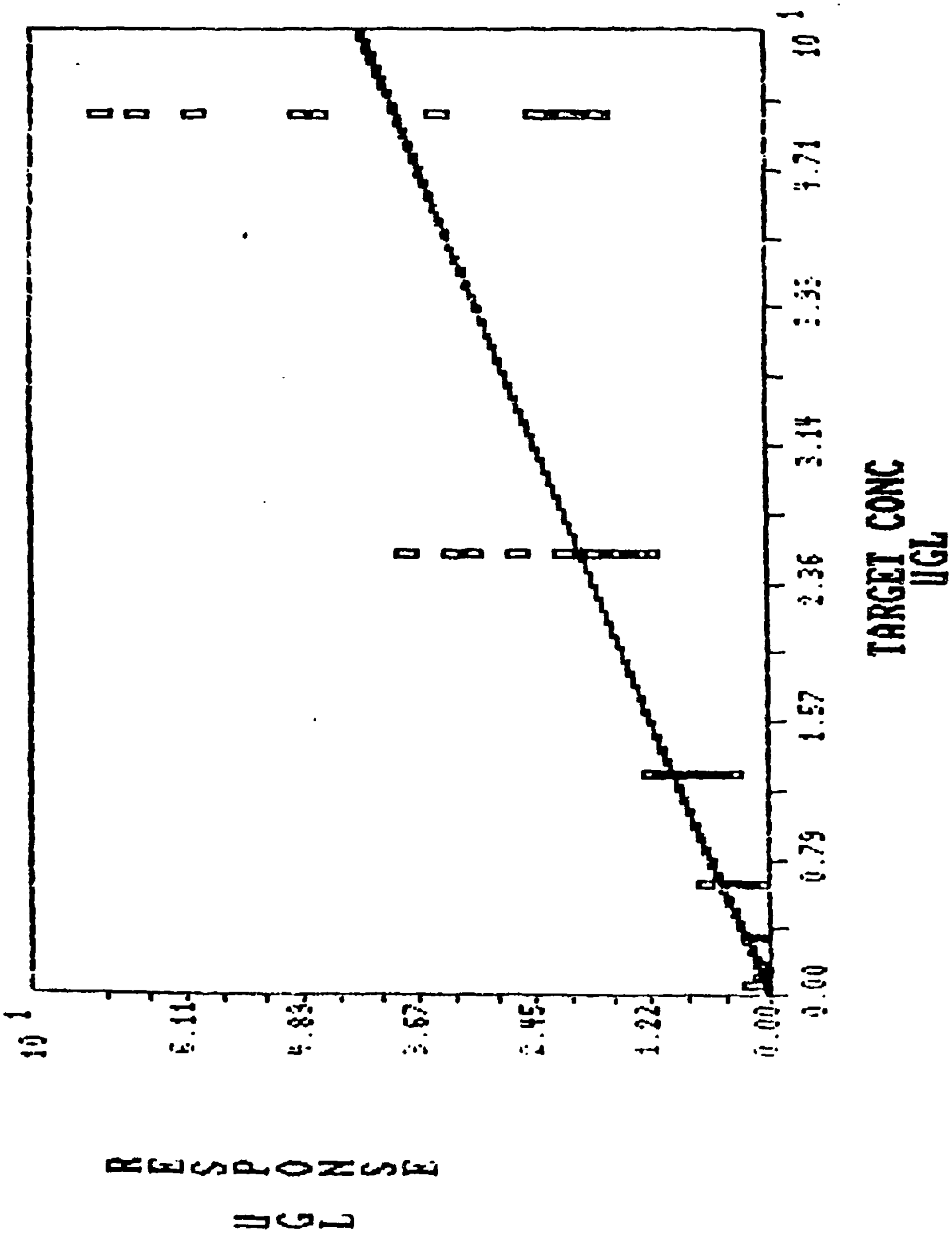


Figure F8

4-AM

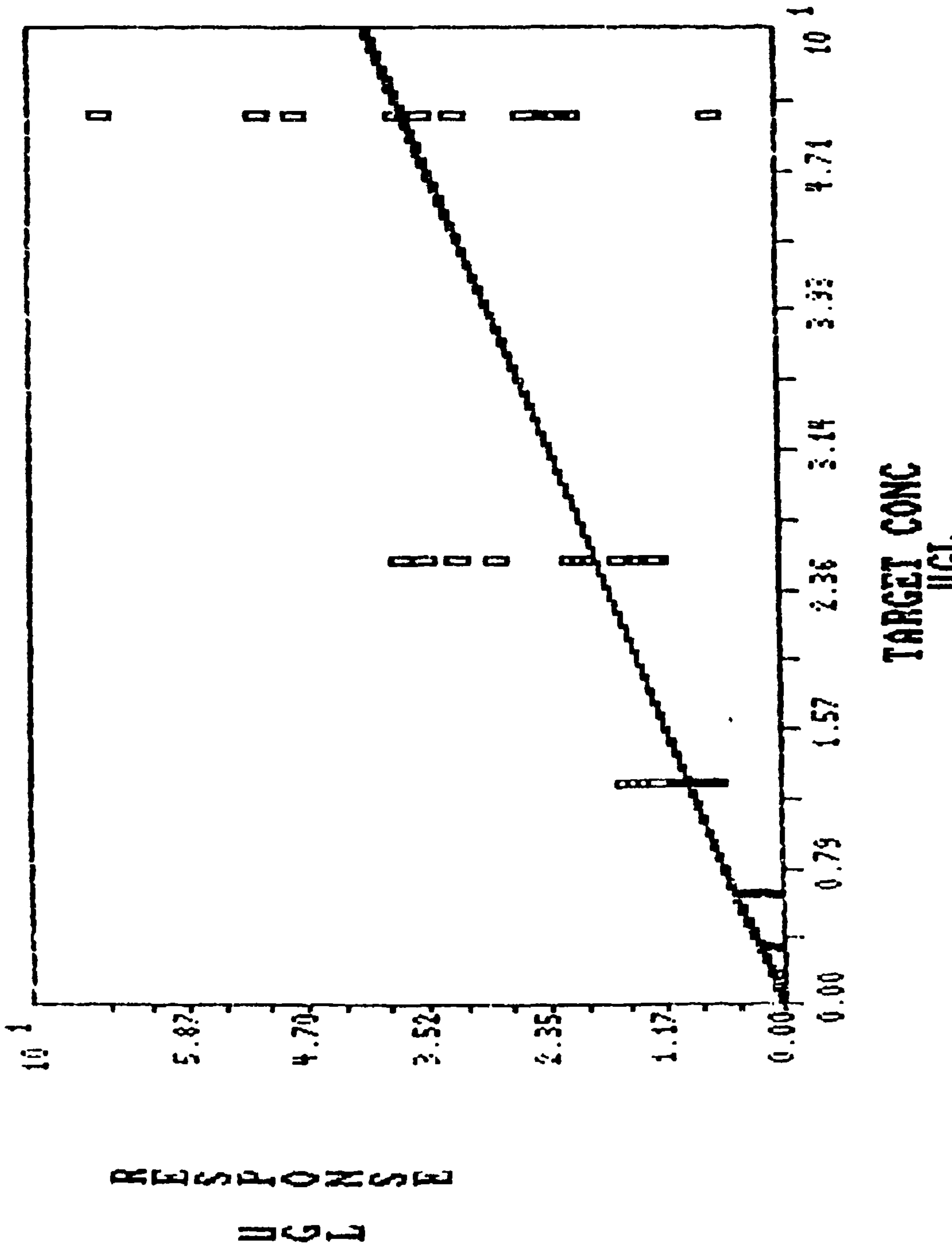


Figure F9

HMX

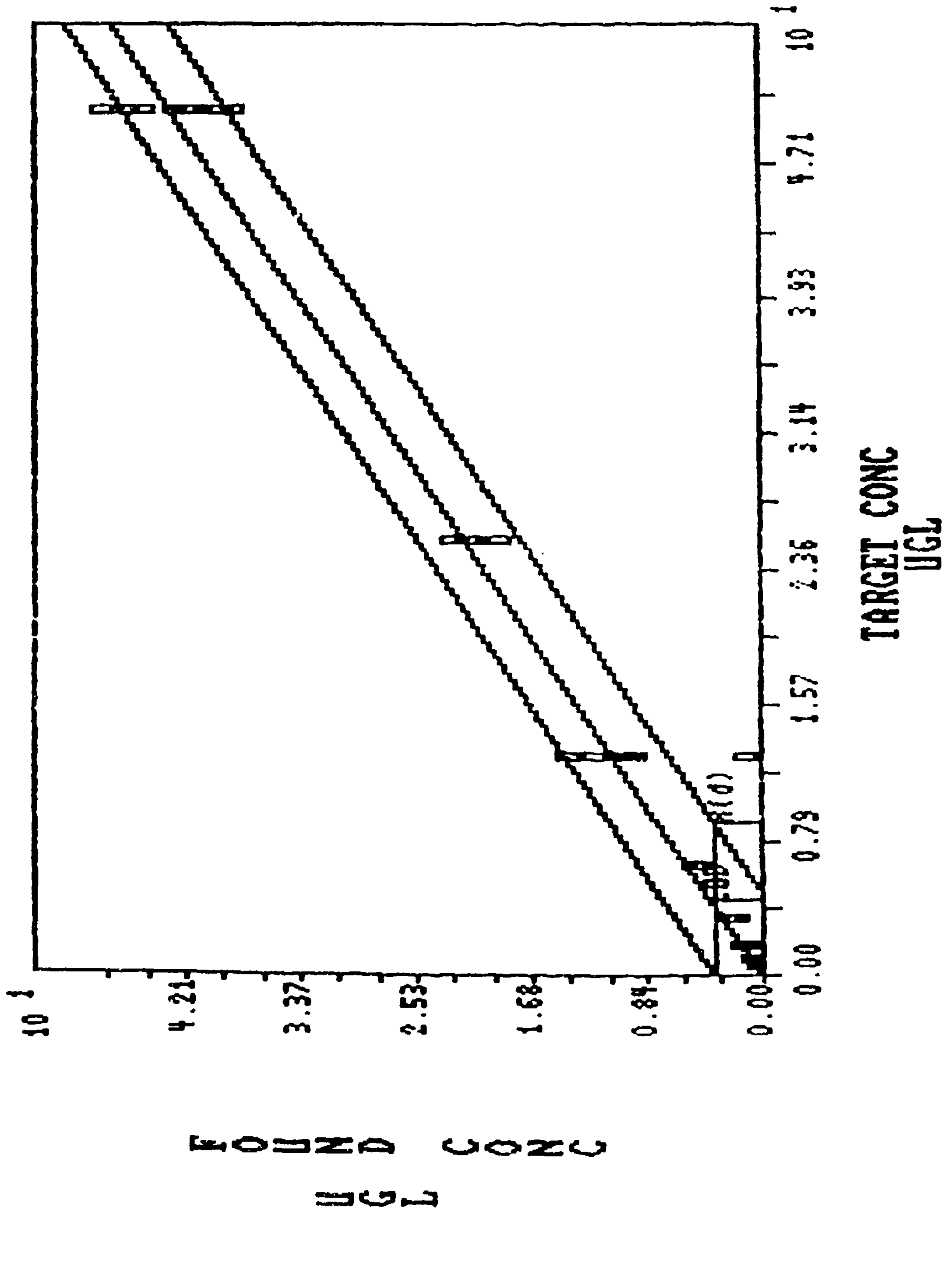


Figure F10

TNB

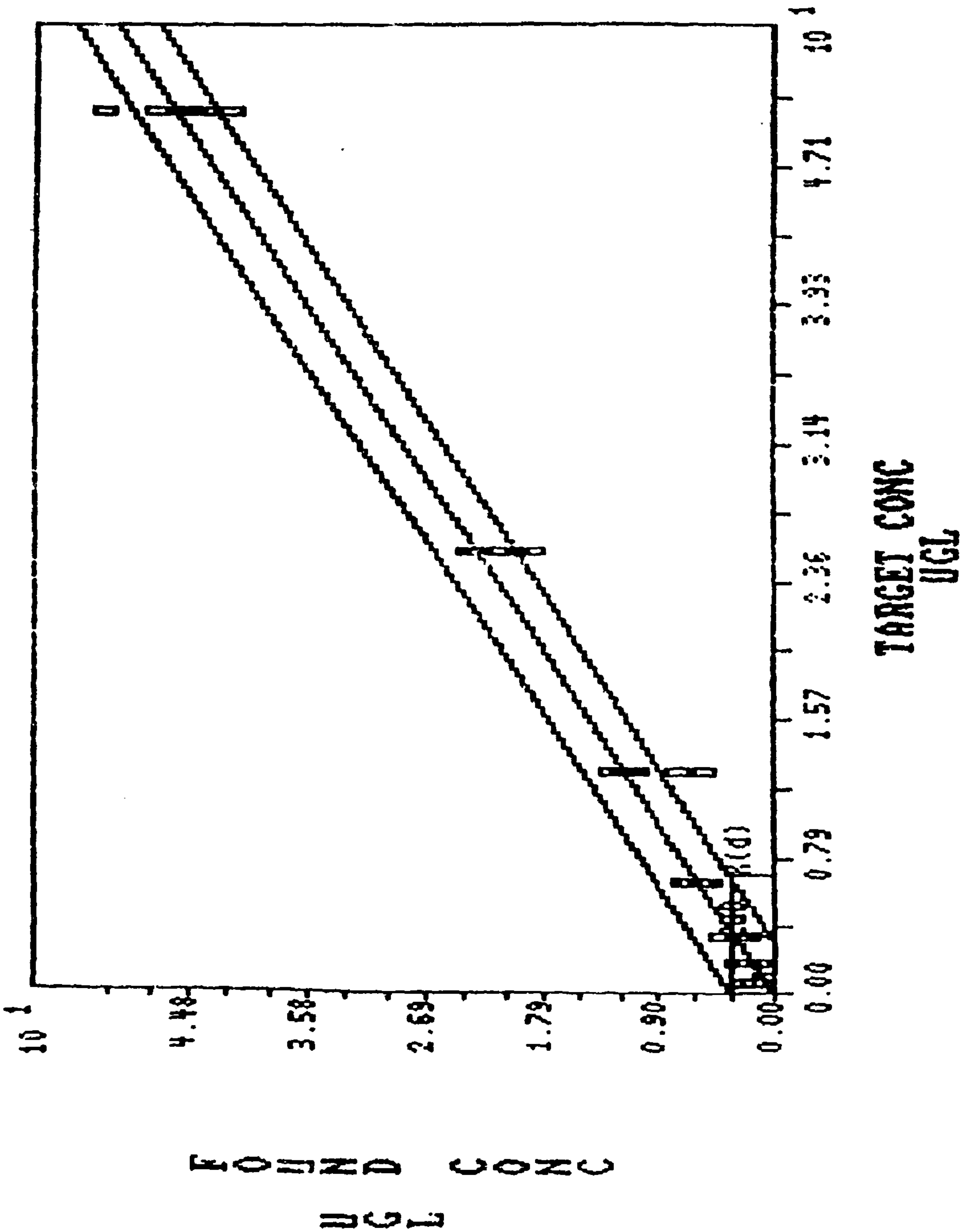


Figure F11

RDX

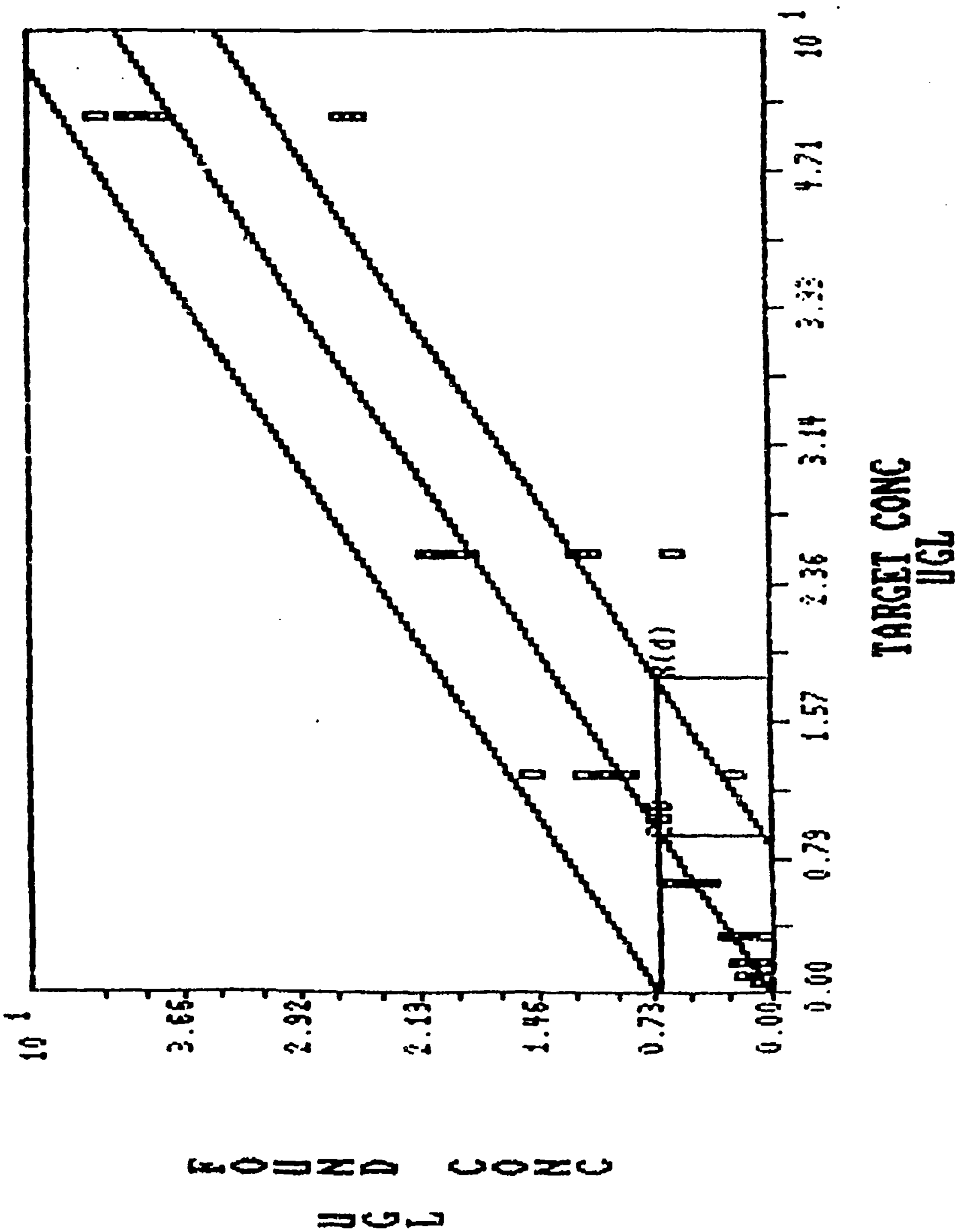


Figure F12

TNT

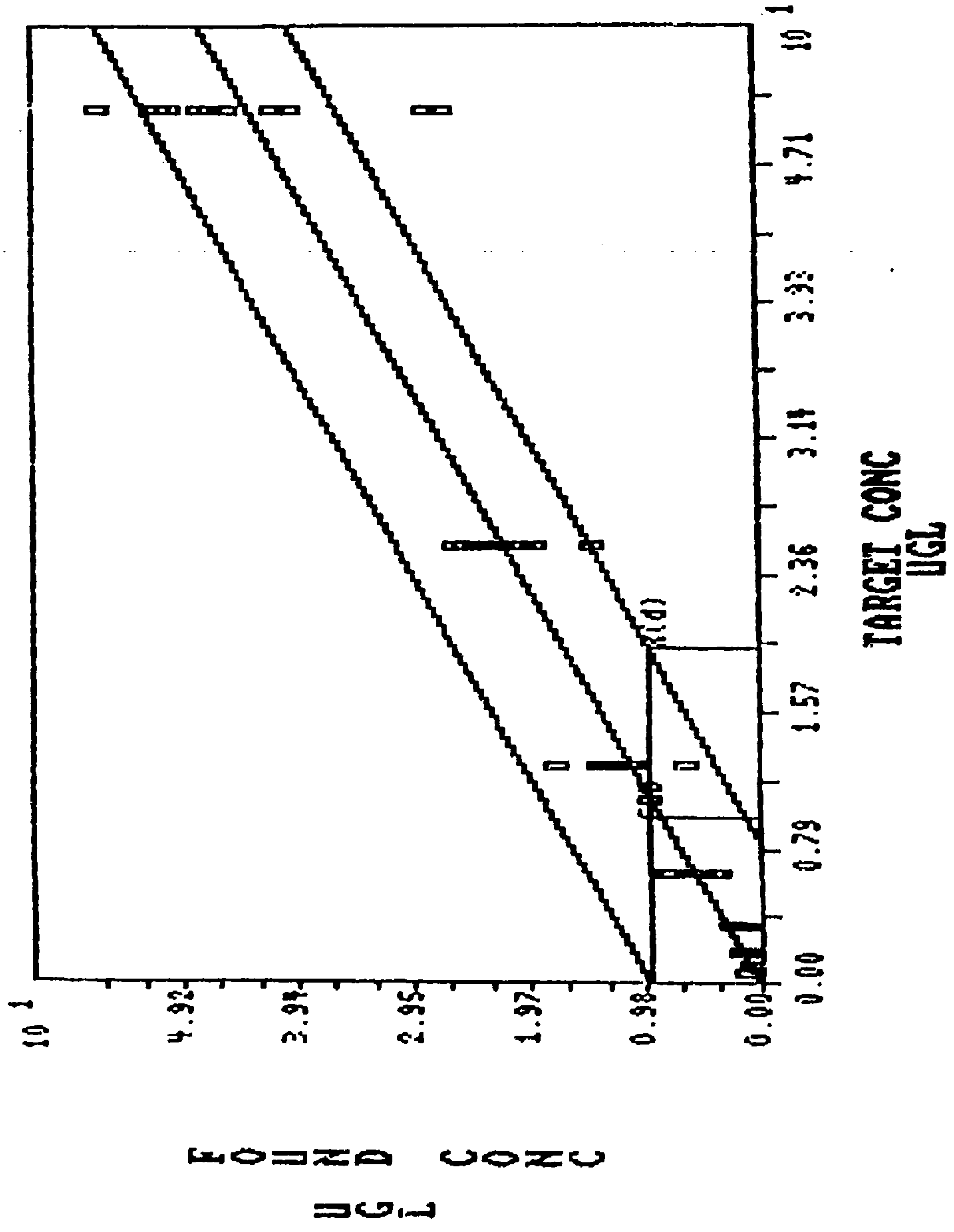


Figure F 13

2,4DNT

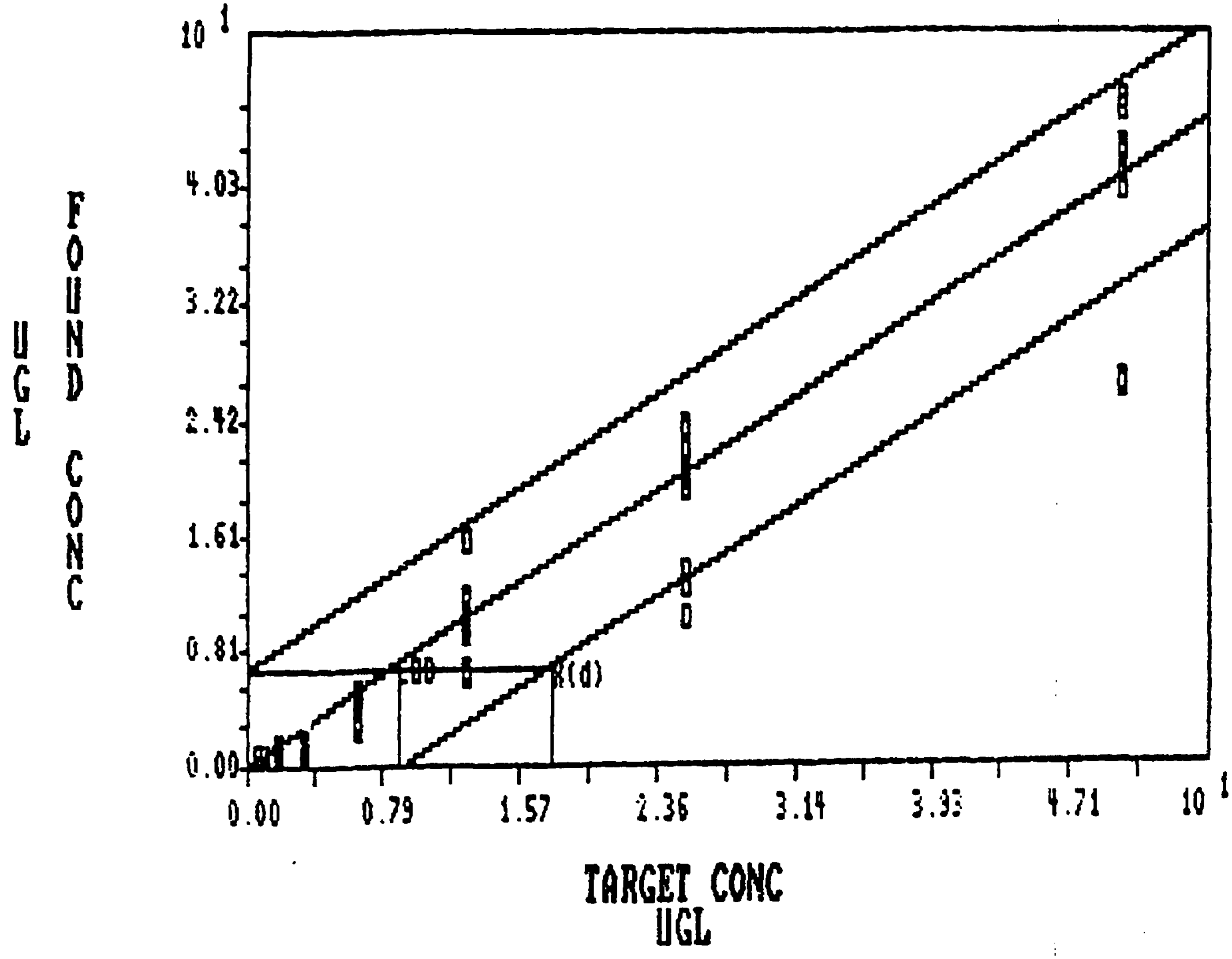


Figure F14

2,6DNT

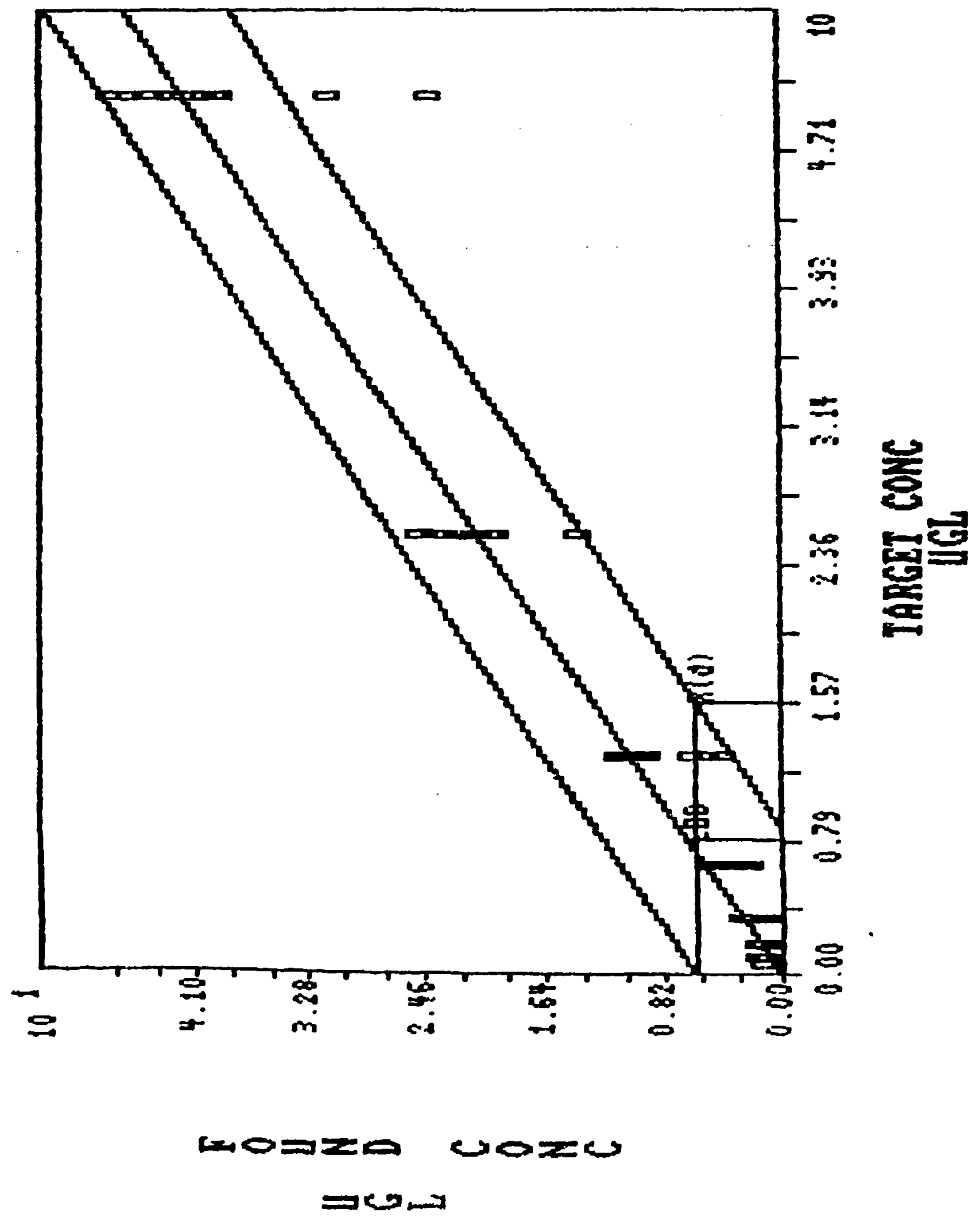


Figure F15

2-AM

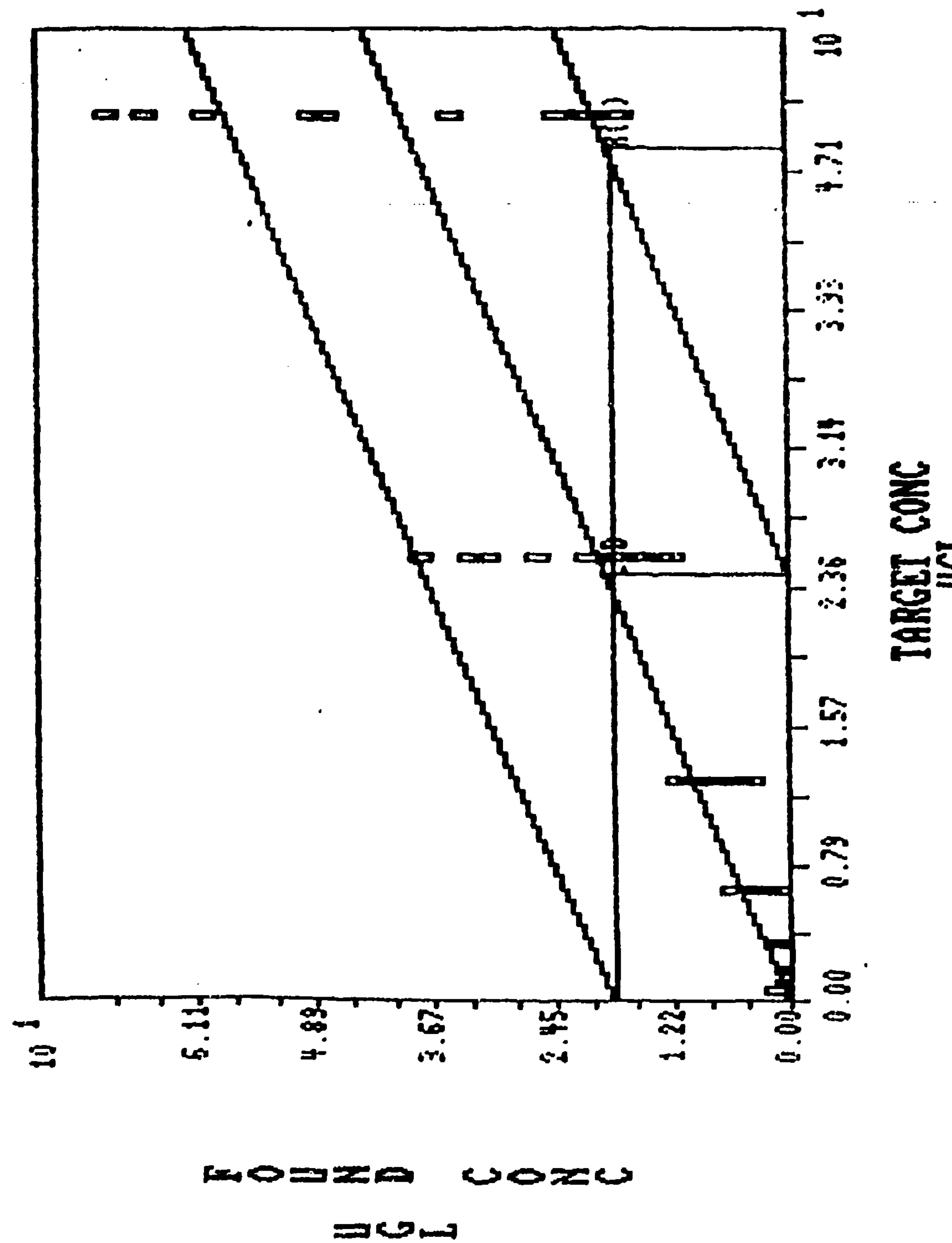


Figure F16

4-AM

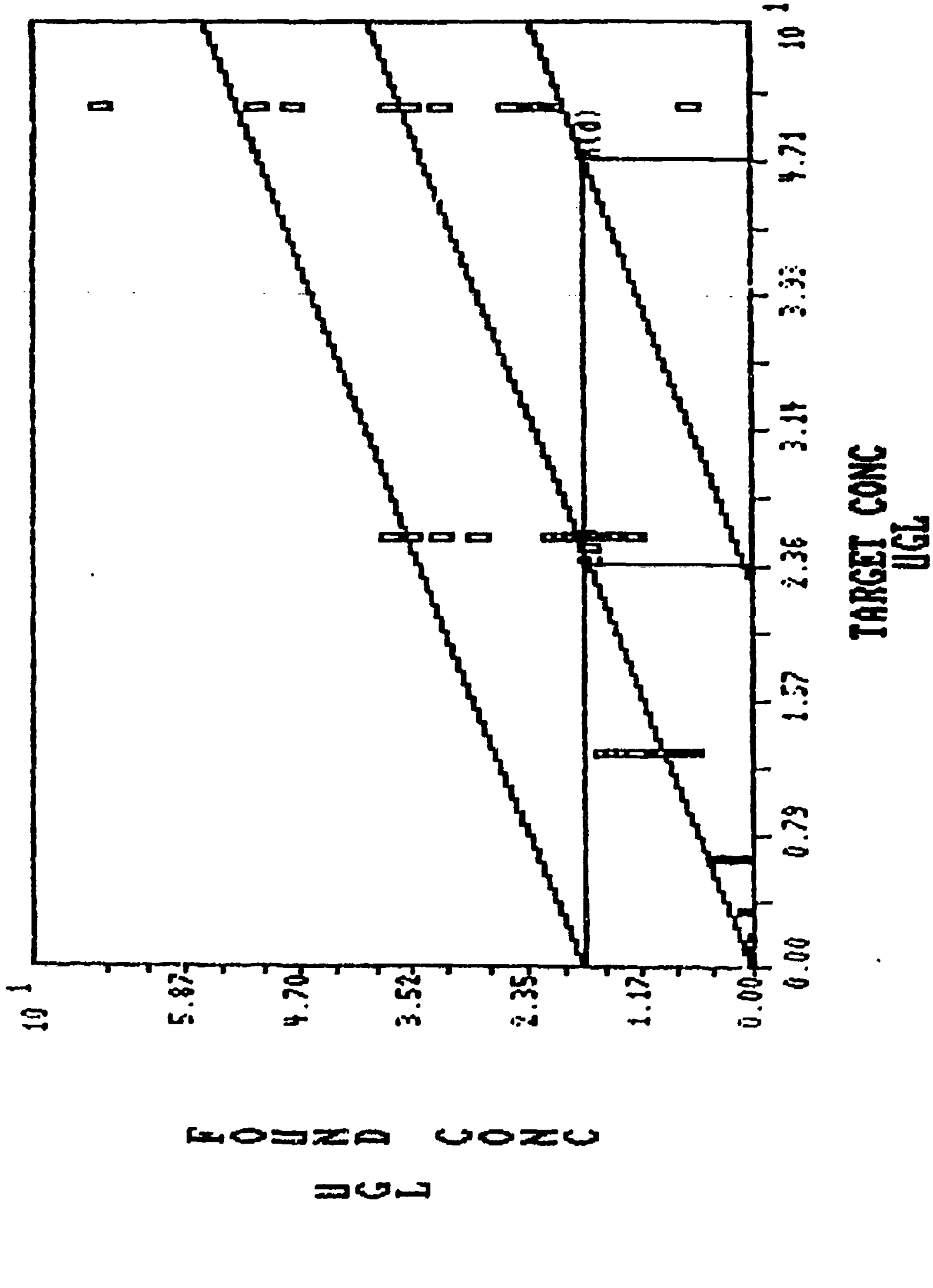


TABLE F9
CRITERION OF DETECTION FROM SOIL (mg/kg)

COMPOUNDS	CD
HMX	2.9
TNB	2.4
RDX	5.8
TNT	6.1
2,4 DNT	5.7
2,6 DNT	5.2
2-AM	15.4
4-AM	14.6

Table F10a

CERTIFICATION ANALYSIS

Report Date: 10/18/93

Method Name:	HMX		Units of Measure:	UGG
Method Number:			Laboratory:	MA
Compound:	HMX		Analysis Date	01/23/91
			Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- $Y = (-0.00399784) + (1.017741420)X$

- Model through the Origin - $Y = (1.017141800)X$

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.306303214	38	0.008060611	0.306750748	39	0.007865404
Total Error:	0.292517170	30	0.009750572	0.292517170	30	0.009750572
Lack of Fit:	0.013786044	8	0.001723255	0.014233578	9	0.001581509

LOF F-Ratio(F): 0.176733779 LOF F-Ratio(F): 0.162196496

Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 0.055521102 Critical 95% F: 4.17

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	10	9.8800000	9.9800000	10.410000	10.370000
2:	5	4.9900000	5.0200000	5.2000000	5.2000000
3:	2.5000000	2.5000000	2.5100000	2.5800000	2.5600000
4:	1.2500000	1.2500000	1.4600000	1.2600000	1.3000000
5:	0.6300000	0.6400000	0.6200000	0.6300000	0.6400000
6:	0.3200000	0.3400000	0.3100000	0.2900000	0.2900000
7:	0.1600000	0.1600000	0.1600000	0.1400000	0.1600000
8:	0.0800000	0.0900000	0.0600000	0.0600000	0.0690000
9:	0.0400000	0.0500000	0.0100000	0.0240000	0.0270000
10:	0.0200000	0.0040000	0.0080000	0.0050000	0.0024000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 10b

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	RADFORD	Units of Measure:	UGG
Method Number:	1	Laboratory:	MM
Compound:	HMX	Analysis Date	12/31/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- : Y = (-0.00458677) + (1.017921390)X

- Model through the Origin - : Y = (1.017233440)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.308793193	38	0.008126137	0.309382294	39	0.007932879
Total Error:	0.294318503	30	0.009810617	0.294318503	30	0.009810617
Lack of Fit:	0.014474690	8	0.001809336	0.015063791	9	0.001673755

LOF F-Ratio(F): 0.184426351 — LOF F-Ratio(F): 0.170606456

Critical 95% F: 2.27 — Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted — Calculated F: 0.072494597 — Critical 95% F: 4.17

****

TABLE OF DATA POINTS — Targets: 10 — Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0200000	0.0040000	0.0080000	0.0050000	+2.40E-04
2:	0.0400000	0.0500000	0.0100000	0.0240000	0.0270000
3:	0.0800000	0.0900000	0.0600000	0.0600000	0.0690000
4:	0.1600000	0.1600000	0.1600000	0.1400000	0.1600000
5:	0.3200000	0.3400000	0.3100000	0.2900000	0.2900000
6:	0.6300000	0.6400000	0.6200000	0.6300000	0.6400000
7:	1.2500000	1.2500000	1.4600000	1.2600000	1.3000000
8:	2.5000000	2.5800000	2.5800000	2.5000000	2.5100000
9:	5	4.9900000	5.0200000	5.2000000	5.2000000
10:	10	9.8800000	9.9800000	10.410000	10.370000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 11a

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	MILAN		Units of Measure:	UGG
Method Number:			Laboratory:	MA
Compound:	TNB		Analysis Date	01/23/91
			Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

	--- Model with Intercept ---			- Model through the Origin -		
	Y = (-0.04333250) + (1.013886250)X			Y = (1.007386980)X		
	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.293087156	38	0.007712820	0.345665012	39	0.008863205
Total Error:	0.217518860	30	0.007250629	0.217518860	30	0.007250629
Lack of Fit:	0.075568296	8	0.009446037	0.128146152	9	0.014238461

LOF F-Ratio(F): 1.302788687   LOF F-Ratio(F): 1.963755419
Critical 95% F: 2.27   Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

**Zero Intercept Rejected Calculated F: 6.816943312 Critical 95% F: 4.17

****

TABLE OF DATA POINTS   Targets: 10   Measures per Target: 4

	Target Value	Found Concentration			
1:	10	10.310000	10.360000	9.9700000	9.9700000
2:	5	4.8600000	4.9300000	5.0100000	5
3:	2.5000000	2.4200000	2.3200000	2.4900000	2.4800000
4:	1.2500000	1.0400000	1.2400000	1.2400000	1.2600000
5:	0.6300000	0.5900000	0.5800000	0.6100000	0.6300000
6:	0.3200000	0.2100000	0.1900000	0.3200000	0.3100000
7:	0.1600000	0.1600000	0.1500000	0.1600000	0.1600000
8:	0.0800000	0.0420000	0.0350000	0.0740000	0.0860000
9:	0.0400000	0.0500000	0.0100000	0.0240000	0.0270000
10:	0.0200000	0.0092000	0.0074000	0.0180000	0.0250000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 11b

CERTIFICATION ANALYSIS — Report Date: 10/12/93

Method Name:	RADFORD	Units of Measure:	UGG
Method Number:	1	Laboratory:	MM
Compound:	TNB	Analysis Date	12/31/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- Y = (-0.04162067) + (1.014855330)X

- Model through the Origin - Y = (1.008612820)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.257655922	38	0.006780419	0.306161703	39	0.007850300
Total Error:	0.204409860	30	0.006813662	0.204409860	30	0.006813662
Lack of Fit:	0.053246062	8	0.006655758	0.101751843	9	0.011305760

LOF F-Ratio(F): 0.976825347 — LOF F-Ratio(F): 1.659278129

Critical 95% F: 2.27 — Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

**Zero Intercept Rejected Calculated F: 7.153802884 Critical 95% F: 4.17

****

TABLE OF DATA POINTS — Targets: 10 — Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0200000	0.0092000	0.0074000	0.0180000	0.0250000
2:	0.0400000	0.0410000	0.0370000	0.0200000	0.0240000
3:	0.0800000	0.0860000	0.0740000	0.0350000	0.0420000
4:	0.1600000	0.0860000	0.0890000	0.1600000	0.1600000
5:	0.3200000	0.2100000	0.1900000	0.3200000	0.3100000
6:	0.6300000	0.6300000	0.6100000	0.5800000	0.5900000
7:	1.2500000	1.0400000	1.2400000	1.2400000	1.2600000
8:	2.5000000	2.4800000	2.4900000	2.5100000	2.5000000
9:	5	4.8600000	4.9300000	5.0100000	5
10:	10	9.9700000	9.9700000	10.310000	10.360000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 12a

CERTIFICATION ANALYSIS   Report Date: 10/19/93

Method Name:	RDX	Units of Measure:	UGG
Method Number:		Laboratory:	MA
Compound:	RDX	Analysis Date	01/23/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept ---   - Model through the Origin -

Y = (-0.01050523) + (1.008102610)X   Y = (1.006526980)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.059094913	38	0.001555129	0.062185112	39	0.001594490
Total Error:	0.035115500	30	0.001170517	0.035115500	30	0.001170517
Lack of Fit:	0.023979413	8	0.002997427	0.027069612	9	0.003007735

LOF F-Ratio(F): 2.560772294   LOF F-Ratio(F): 2.569578676
Critical 95% F: 2.27   Critical 95% F: 2.21
Data Not Linear   Data Not Linear

ZERO INTERCEPT HYPOTHESIS

** Models not linear. Do not test Zero Intercept hypothesis.

Diagnose and correct analytical system before continuing.

****

TABLE OF DATA POINTS   Targets: 10   Measures per Target: 4

	Target Value	Found Concentration			
1:	10	10.060000	10.150000	10.150000	10.060000
2:	5	4.8900000	4.9400000	5.0500000	5.0200000
3:	2.5000000	2.4400000	2.4700000	2.5100000	2.5200000
4:	1.2500000	1.2100000	1.2300000	1.2200000	1.2900000
5:	0.6300000	0.6300000	0.6100000	0.6200000	0.6200000
6:	0.3200000	0.3400000	0.3300000	0.3400000	0.3100000
7:	0.1600000	0.1600000	0.1500000	0.1700000	0.1900000
8:	0.0800000	0.0790000	0.0900000	0.0880000	0.1000000
9:	0.0400000	0.0230000	0.0310000	0.0310000	0.0500000
10:	0.0200000	0.0320000	0.0200000	0.0020000	0.0020000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 12b

CERTIFICATION ANALYSIS Report Date: 10/12/93

Method Name:	RADFORD	Units of Measure:	UGG
Method Number:	1	Laboratory:	MM
Compound:	RDX	Analysis Date	12/31/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- Y = (0.013858142) + (1.001916230)X

- Model through the Origin - Y = (1.003992260)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.373006260	34	0.010970772	0.377621272	35	0.010789179
Total Error:	0.226222000	27	0.008378593	0.226222000	27	0.008378593
Lack of Fit:	0.146784260	7	0.020969180	0.151399272	8	0.018924909

LOF F-Ratio(F): 2.502709109 LOF F-Ratio(F): 2.258721711

Critical 95% F: 2.37 Critical 95% F: 2.31

Data Not Linear

ZERO INTERCEPT HYPOTHESIS

** Intercept model not linear. Do not test Zero Intercept hypothesis.

Diagnose and correct analytical system before continuing.

****

TABLE OF DATA POINTS Targets: 9 Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0400000	0	0	0.0270000	0.0270000
2:	0.0800000	0	0.0580000	0.0600000	0.0600000
3:	0.1600000	0.1400000	0.2100000	0.1900000	0.1900000
4:	0.3200000	0.2600000	0.3900000	0.1900000	0.3400000
5:	0.6250000	0.6100000	0.6300000	0.5800000	0.5800000
6:	1.2500000	1.5000000	1.4000000	1.3000000	1.1000000
7:	2.5000000	2.6000000	2.5000000	2.8000000	2.8000000
8:	5	5.1000000	5.1000000	4.9000000	4.9000000
9:	10	10	10.010000	10	10

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

CERTIFICATION ANALYSIS

Report Date: 10/19/93

Method Name:	TNT	Units of Measure:	UGG
Method Number:		Laboratory:	MA
Compound:	TNT	Analysis Date	01/23/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- : Y = (-0.01813630) + (1.007155650)X

- Model through the Origin - : Y = (1.004435460)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.113801306	38	0.002994771	0.123011588	39	0.003154143
Total Error:	0.102973750	30	0.003432458	0.102973750	30	0.003432458
Lack of Fit:	0.010827556	8	0.001353444	0.020037838	9	0.002226426

LOF F-Ratio(F): 0.394307627 LOF F-Ratio(F): 0.648639030
Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 3.075454301 Critical 95% F: 4.17

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	10	9.9300000	10.110000	10.180000	10.080000
2:	5	4.8600000	4.8900000	5.1100000	5.0700000
3:	2.5000000	2.4600000	2.4400000	2.5200000	2.5500000
4:	1.2500000	1.1500000	1.2000000	1.2300000	1.2900000
5:	0.6300000	0.6200000	0.5900000	0.6400000	0.6200000
6:	0 3200000	0.3200000	0.2900000	0.3100000	0.3400000
7:	0.1600000	0.1400000	0.1400000	0.1600000	0.1800000
8:	0.0800000	0.0640000	0.0660000	0.0740000	0.0840000
9:	0.0400000	0.0280000	0.0280000	0.0270000	0.0260000
10:	0.0200000	0.0020000	0.0020000	0.0140000	0.0120000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 13b

CERTIFICATION ANALYSIS — Report Date: 10/12/93

Method Name:	RADFORD	Units of Measure:	UGG
Method Number:	1	Laboratory:	MM
Compound:	TNT	Analysis Date	12/31/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- : Y = (-0.01801080) + (1.007417900)X

- Model through the Origin - : Y = (1.004716530)X

	Model with Intercept (SS)	(df)	(MS)	Model through the Origin (SS)	(df)	(MS)
Residual:	0.110208263	38	0.002900217	0.119291521	39	0.003058757
Total Error:	0.101346750	30	0.003378225	0.101346750	30	0.003378225
Lack of Fit:	0.008861513	8	0.001107689	0.017944771	9	0.001993863

Model with Intercept	Model through the Origin
LOF F-Ratio(F): 0.327890867	LOF F-Ratio(F): 0.590210375
Critical 95% F: 2.27	Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted   Calculated F: 3.131923094   Critical 95% F: 4.17

****

TABLE OF DATA POINTS   Targets: 10   Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0200000	0	0	0.0140000	0.0120000
2:	0.0400000	0.0260000	0.0270000	0.0280000	0.0280000
3:	0.0800000	0.0640000	0.0660000	0.0740000	0.0840000
4:	0.1600000	0.1400000	0.1400000	0.1600000	0.1800000
5:	0.3200000	0.3400000	0.3100000	0.3200000	0.2900000
6:	0.6300000	0.6200000	0.5900000	0.6400000	0.6200000
7:	1.2500000	1.2900000	1.2300000	1.1500000	1.2000000
8:	2.5000000	2.4600000	2.4400000	2.5200000	2.5500000
9:	5	5.0700000	5.1100000	4.8400000	4.9400000
10:	10	9.9300000	10.110000	10.180000	10.080000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

CERTIFICATION ANALYSIS | Report Date: 10/18/93

Method Name:	2,4	Units of Measure:	UGG
Method Number:		Laboratory:	MA
Compound:	2,4	Analysis Date	01/23/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- : Y = (-0.02530612) + (1.025863060)X

- Model through the Origin - : Y = (1.022067500)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.405071561	38	0.010659778	0.423003471	39	0.010846243
Total Error:	0.360487280	30	0.012016243	0.360487280	30	0.012016243
Lack of Fit:	0.044584281	8	0.005573035	0.062516191	9	0.006946243

LOF F-Ratio(F): 0.463791826   LOF F-Ratio(F): 0.578071169

Critical 95% F: 2.27   Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted   Calculated F: 1.682202963   Critical 95% F: 4.17

****

TABLE OF DATA POINTS   Targets: 10   Measures per Target: 4

	Target Value	Found Concentration			
1:	10	10.090000	10.110000	10.560000	10.360000
2:	5	4.8400000	4.8500000	5.2500000	5.2000000
3:	2.5000000	2.3700000	2.3900000	2.5700000	2.6300000
4:	1 2500000	1.2000000	1.2000000	1.2600000	1.3100000
5:	0 6300000	0.6200000	0.5900000	0.6500000	0.6700000
6:	0.3200000	0.3400000	0.3400000	0.3100000	0.3100000
7:	0.1600000	0.1500000	0.1500000	0.1600000	0.1900000
8:	0.0800000	0.0730000	0.0720000	0.0800000	0.0730000
9:	0.0400000	0.0220000	0.0140000	0.0088000	0.0360000
10:	0.0200000	0.0020000	0.0020000	0.0020000	0.0020000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 14b

CERTIFICATION ANALYSIS Report Date: 10/12/93

Method Name:	RADFORD	Units of Measure:	UGG
Method Number:	1	Laboratory:	MM
Compound:	2-4DNT	Analysis Date	12/31/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- Y = (-0.02459154) + (1.023768270)X

- Model through the Origin - Y = (1.020079880)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.460537936	38	0.012119419	0.477471436	39	0.012242857
Total Error:	0.416563030	30	0.013885434	0.416563030	30	0.013885434
Lack of Fit:	0.043974906	8	0.005496863	0.060908406	9	0.006767601

LOF F-Ratio(F): 0.395872619 LOF F-Ratio(F): 0.487388475
Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 1.397220402 Critical 95% F: 4.17

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0200000	0	0	0	0
2:	0.0400000	0.0220000	0.0140000	0.0088000	0.0360000
3:	0.0800000	0.0730000	0.0800000	0.0720000	0.0730000
4:	0.1600000	0.1500000	0.1500000	0.1600000	0.1900000
5:	0.3200000	0.3100000	0.3100000	0.3400000	0.3400000
6:	0.6300000	0.6200000	0.5900000	0.6500000	0.6700000
7:	1.2500000	1.2000000	1.2000000	1.2600000	1.3100000
8:	2.5000000	2.3700000	2.3900000	2.5700000	2.6300000
9:	5	4.8400000	4.8000000	5.2500000	5.2000000
10:	10	10.009000	10.110000	10.560000	10.360000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

CERTIFICATION ANALYSIS

Report Date: 10/18/93

Method Name:	2,6	Units of Measure:	UGG
Method Number:		Laboratory:	MA
Compound:	2,6	Analysis Date	01/23/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- Y = (-0.03122974) + (1.047214870)X

- Model through the Origin - Y = (1.042530850)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	1.981234090	38	0.052137739	2.008543500	39	0.051501115
Total Error:	1.940400000	30	0.064680000	1.940400000	30	0.064680000
Lack of Fit:	0.040834090	8	0.005104261	0.068143500	9	0.007571500

LOF F-Ratio(F): 0.078915604 LOF F-Ratio(F): 0.117060915
Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 0.523793521 Critical 95% F: 4.17

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	10	10.140000	9.8100000	11.240000	10.730000
2:	5	4.7800000	4.8000000	5.5700000	5.4600000
3:	2.5000000	2.3200000	2.3200000	2.6800000	2.7700000
4:	1.2500000	1.3800000	1.2900000	1.2600000	1.2100000
5:	0.6300000	0.6000000	0.5900000	0.6800000	0.7100000
6:	0.3200000	0.3700000	0.2800000	0.3500000	0.3700000
7:	0.1600000	0.1700000	0.2100000	0.1400000	0.1200000
8:	0.0800000	0.0590000	0.0460000	0.0800000	0.0430000
9:	0.0200000	0	0	0	0
10:	0.0400000	0	0	0	0

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 15b

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	RADFORD		Units of Measure:	UGG
Method Number:	1		Laboratory:	MM
Compound:	2-6DNT		Analysis Date	12/31/91
			Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- $Y = (-0.03122974) + (1.047214870)X$

- Model through the Origin - $Y = (1.042530850)X$

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	1.981234090	38	0.052137739	2.008543500	39	0.051501115
Total Error:	1.940400000	30	0.064680000	1.940400000	30	0.064680000
Lack of Fit:	0.040834090	8	0.005104261	0.068143500	9	0.007571500

LOF F-Ratio(F): 0.078915604 LOF F-Ratio(F): 0.117060915

Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 0.523793521 Critical 95% F: 4.17

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0200000	0	0	0	0
2:	0.0400000	0	0	0	0
3:	0.0800000	0.0460000	0.0590000	0.0800000	0.0430000
4:	0.1600000	0.1200000	0.1400000	0.1700000	0.2100000
5:	0.3200000	0.3200000	0.2800000	0.3500000	0.3700000
6:	0.6300000	0.7100000	0.6800000	0.5900000	0.6000000
7:	1.2500000	1.2600000	1.2100000	1.2900000	1.3800000
8:	2.5000000	2.7700000	2.6800000	2.3200000	2.3200000
9:	5	4.7800000	4.8000000	5.5700000	5.4600000
10:	10	10.140000	9.8100000	11.240000	10.730000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 16a

CERTIFICATION ANALYSIS   Report Date: 10/18/93

Method Name:	2AM	Units of Measure:	UGG
Method Number:		Laboratory:	MA
Compound:	2AM	Analysis Date	01/23/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept ---   - Model through the Origin -

Y = (-0.04092383) + (1.009736910)X   Y = (1.003598910)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.263036377	38	0.006922010	0.309931526	39	0.007946962
Total Error:	0.218409500	30	0.007280317	0.218409500	30	0.007280317
Lack of Fit:	0.044626877	8	0.005578360	0.091522026	9	0.010169114

LOF F-Ratio(F): 0.766224861   LOF F-Ratio(F): 1.396795561

Critical 95% F: 2.27   Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

**Zero Intercept Rejected Calculated F: 6.774787892 Critical 95% F: 4.17

****

TABLE OF DATA POINTS   Targets: 10   Measures per Target: 4

	Target Value	Found Concentration			
1:	10	9.9800000	10.030000	10.430000	9.9500000
2:	5	4.8300000	5.0500000	4.9200000	5.0400000
3:	2.5000000	2.3800000	2.4100000	2.4900000	2.4100000
4:	1.2500000	1.1900000	1.1700000	1.2100000	1.1700000
5:	0.6300000	0.6200000	0.5700000	0.5600000	0.7100000
6:	0.3200000	0.2500000	0.3300000	0.3400000	0.3300000
7:	0.1600000	0.1400000	0.1800000	0.1400000	0.0750000
8:	0.0800000	0.0430000	0.0800000	0.0230000	0.0560000
9:	0.0400000	0.0190000	0.0020000	0.0040000	0.0020000
10:	0.0200000	0.0020000	0.0020000	0.0020000	0.0020000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 16b

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	RADFORD		Units of Measure:	UGG
Method Number:	1		Laboratory:	MM
Compound:	2AMDNT		Analysis Date	12/31/91
			Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- Y = (-0.04248105) + (1.009965530)X

- Model through the Origin - Y = (1.003593960)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.262130576	38	0.006898173	0.312662515	39	0.008016988
Total Error:	0.218400500	30	0.007280017	0.218400500	30	0.007280017
Lack of Fit:	0.043730076	8	0.005466260	0.094262015	9	0.010473557

LOF F-Ratio(F): 0.750858102 LOF F-Ratio(F): 1.438672149

Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

**Zero Intercept Rejected Calculated F: 7.325409005 Critical 95% F: 4.17

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0200000	0	0	0	0
2:	0.0400000	0.0190000	0	0	0
3:	0.0800000	0.0560000	0.0230000	0.0230000	0.0710000
4:	0.1600000	0.0760000	0.1400000	0.1400000	0.1800000
5:	0.3200000	0.3400000	0.3300000	0.3300000	0.2500000
6:	0.6300000	0.6200000	0.5700000	0.5600000	0.7100000
7:	1.2500000	1.1900000	1.1700000	1.1700000	1.2100000
8:	2.5000000	2.3800000	2.4100000	2.4100000	2.4900000
9:	5	4.8300000	5.0500000	5.0400000	4.9200000
10:	10	9.9800000	10.030000	10.430000	9.9500000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 17a

CERTIFICATION ANALYSIS Report Date: 10/18/93

Method Name:	MILAN	Units of Measure:	UGG
Method Number:		Laboratory:	MA
Compound:	4AMDNT	Analysis Date	01/23/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- $Y = (-0.05365346) + (1.006851730)X$

- Model through the Origin - $Y = (0.998804462)X$

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.181320988	38	0.004771605	0.261927629	39	0.006716093
Total Error:	0.138595000	30	0.004619833	0.138595000	30	0.004619833
Lack of Fit:	0.042725988	8	0.005340748	0.123332629	9	0.013703625

LOF F-Ratio(F): 1.156047873 LOF F-Ratio(F): 2.966259702
Critical 95% F: 2.27 Critical 95% F: 2.21
Data Not Linear

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Rejected Calculated F: 16.89298295 Critical 95% F: 4.17
Model not linear through Origin

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	10	10.030000	10	10.160000	9.9900000
2:	5	4.8700000	4.8500000	4.9100000	5.1000000
3:	2.5000000	2.3800000	2.4000000	2.4900000	2.4900000
4:	1.2500000	1.2100000	1.1600000	1.2200000	1.2100000
5:	0.6300000	0.6000000	0.6100000	0.5800000	0.6500000
6:	0.3200000	0.3500000	0.3200000	0.2100000	0.0360000
7:	0.1600000	0.0600000	0.0650000	0.1100000	0.0810000
8:	0.0800000	0.0210000	0.0320000	0.0360000	0.0210000
9:	0.0400000	0.0830000	0.0360000	0.0210000	0.0020000
10:	0.0200000	0.0020000	0.0020000	0.0020000	0.0020000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 17b

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	RADFORD	Units of Measure:	UGG
Method Number:	1	Laboratory:	MM
Compound:	4AMDNT	Analysis Date	12/31/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- Y = (-0.05243419) + (1.006758340)X

- Model through the Origin - Y = (0.998893951)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.134476662	38	0.003538860	0.211461379	39	0.005422087
Total Error:	0.106517568	30	0.003550586	0.106517568	30	0.003550586
Lack of Fit:	0.027959094	8	0.003494887	0.104943811	9	0.011660423

LOF F-Ratio(F): 0.984312771
Critical 95% F: 2.27

LOF F-Ratio(F): 3.284084587
Critical 95% F: 2.21
Data Not Linear

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Rejected Calculated F: 21.75410367 Critical 95% F: 4.17
Model not linear through Origin

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0200000	0	0	0	0
2:	0.0400000	0.0083000	0	0	0.0190000
3:	0.0800000	0.0210000	0.0360000	0.0320000	0.0210000
4:	0.1600000	0.0650000	0.0600000	0.1100000	0.0810000
5:	0.3200000	0.1200000	0.2900000	0.3200000	0.3500000
6:	0.6300000	0.6100000	0.6000000	0.5800000	0.6500000
7:	1.2500000	1.2200000	1.2100000	1.1600000	1.2100000
8:	2.5000000	2.3800000	2.4000000	2.4900000	2.4900000
9:	5	4.8700000	4.8500000	5.1000000	4.9100000
10:	10	10.030000	10	10.160000	9.9900000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

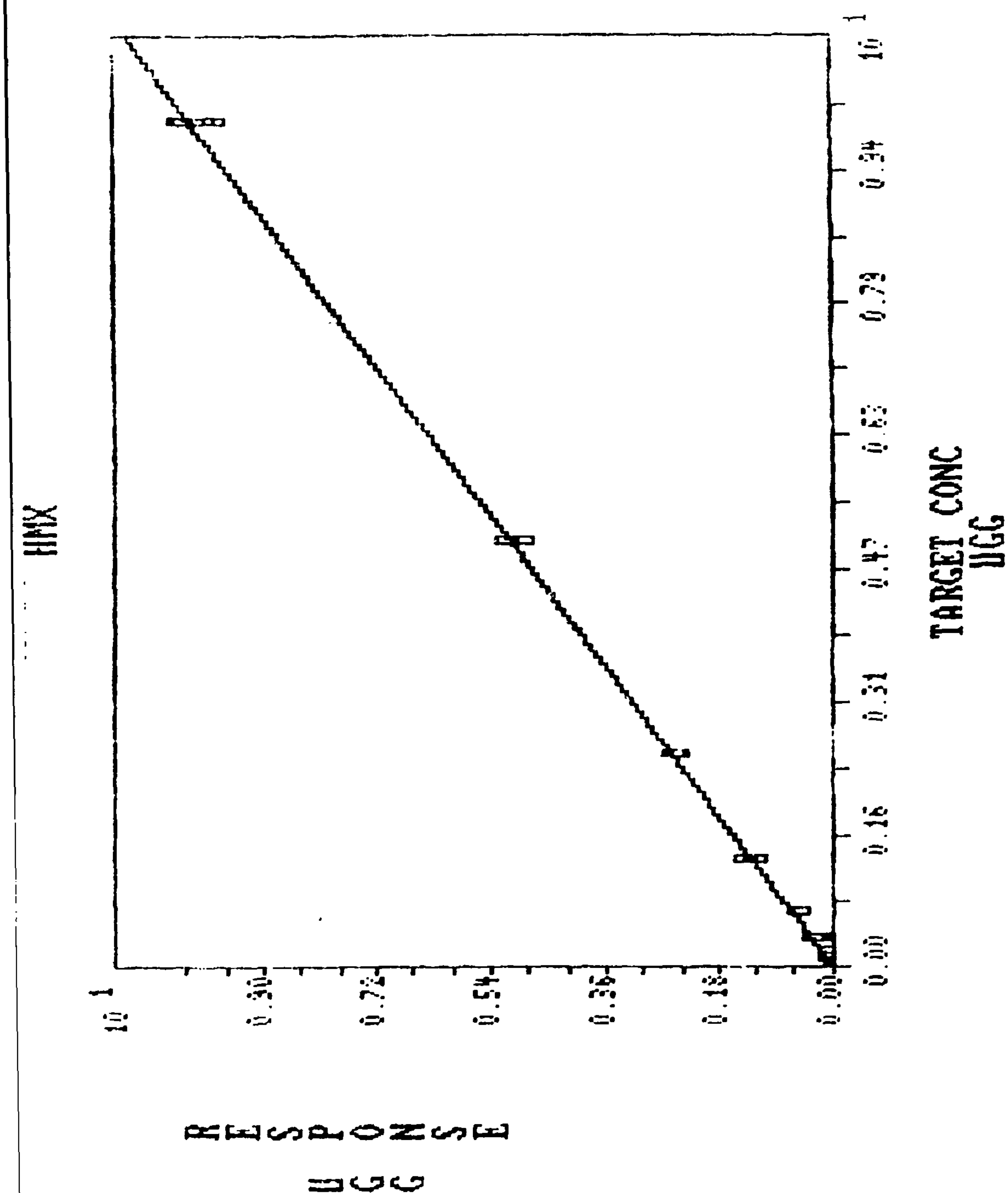

HMX
TARGET CONC
UGG
RESPONSE
UGG

FIGURE F 17b

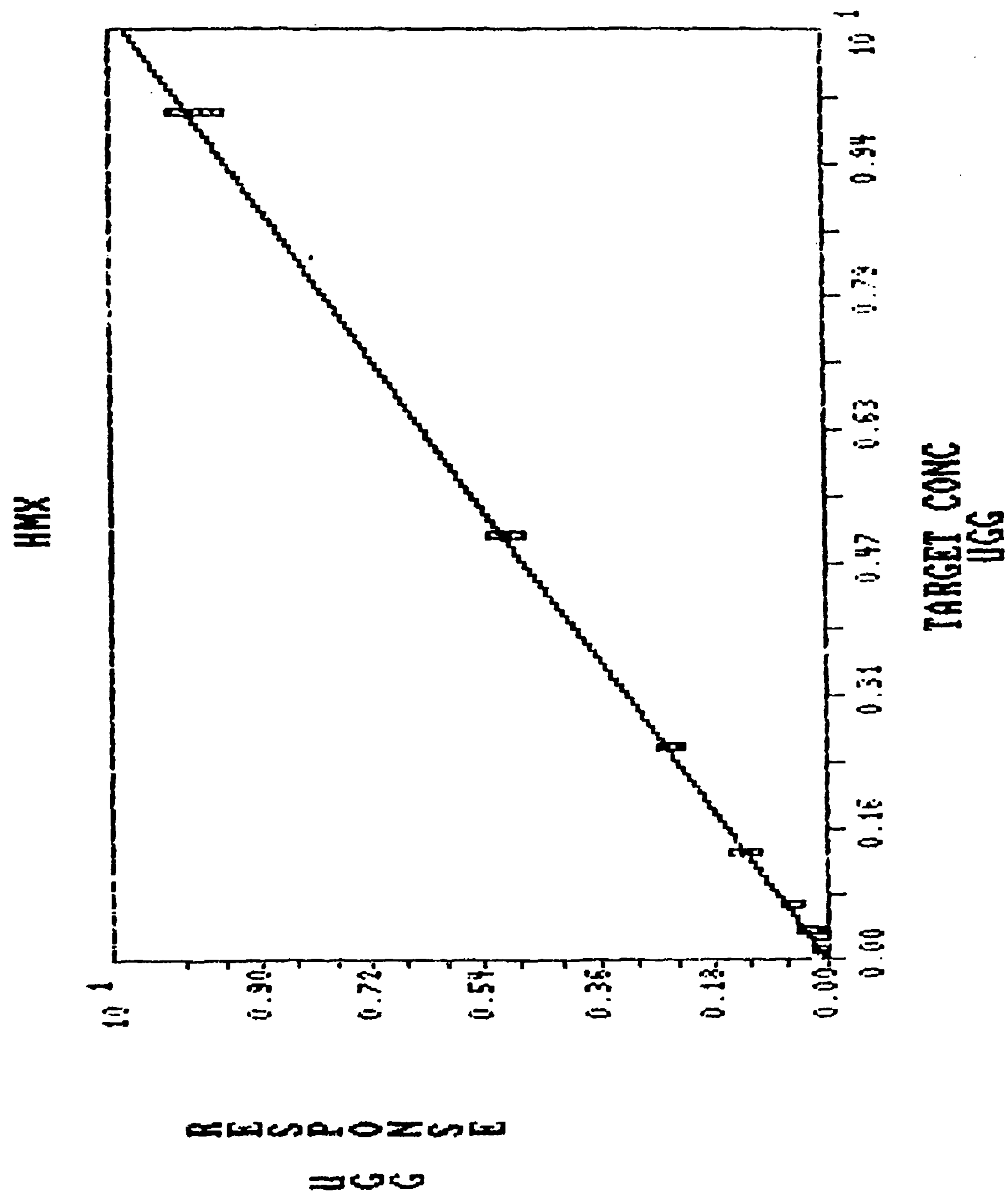

HMX
RESPONSE
UGG
TARGET CONC
UGG
0.00
0.54
0.72
0.90
0.16
0.31
0.47
0.63
0.94

FIGURE F 18a

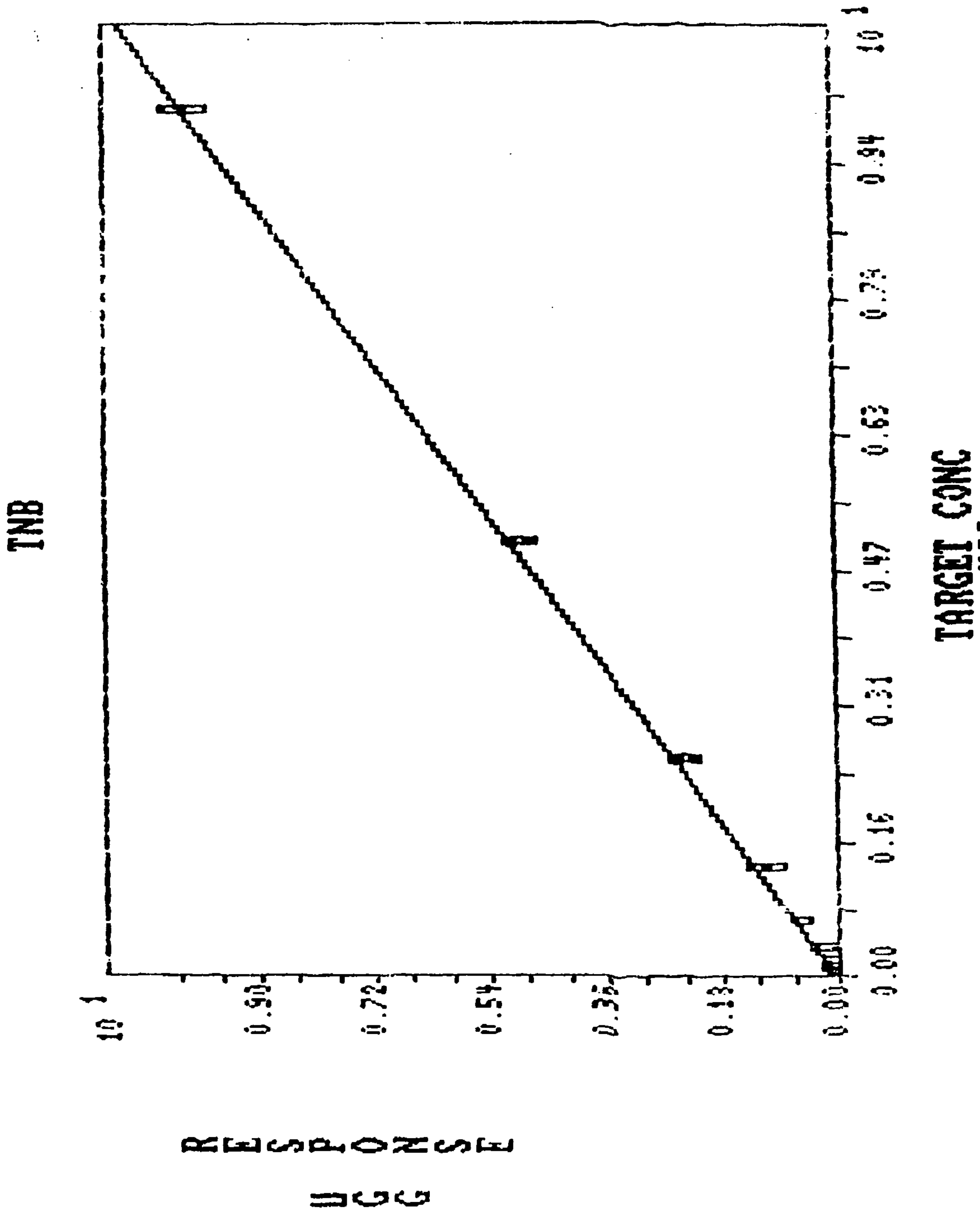


FIGURE F 18b

TNB

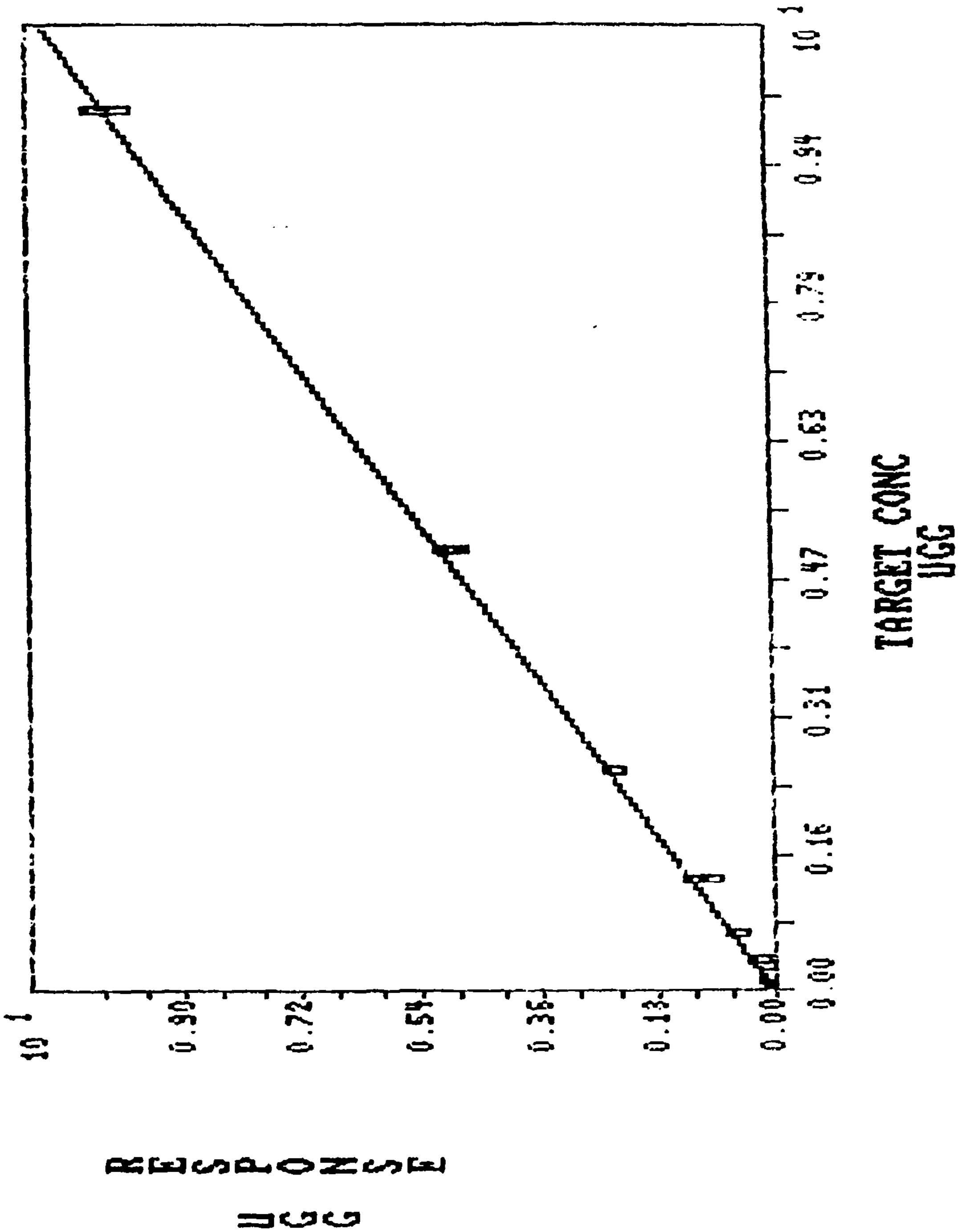


FIGURE F 19a
RDX

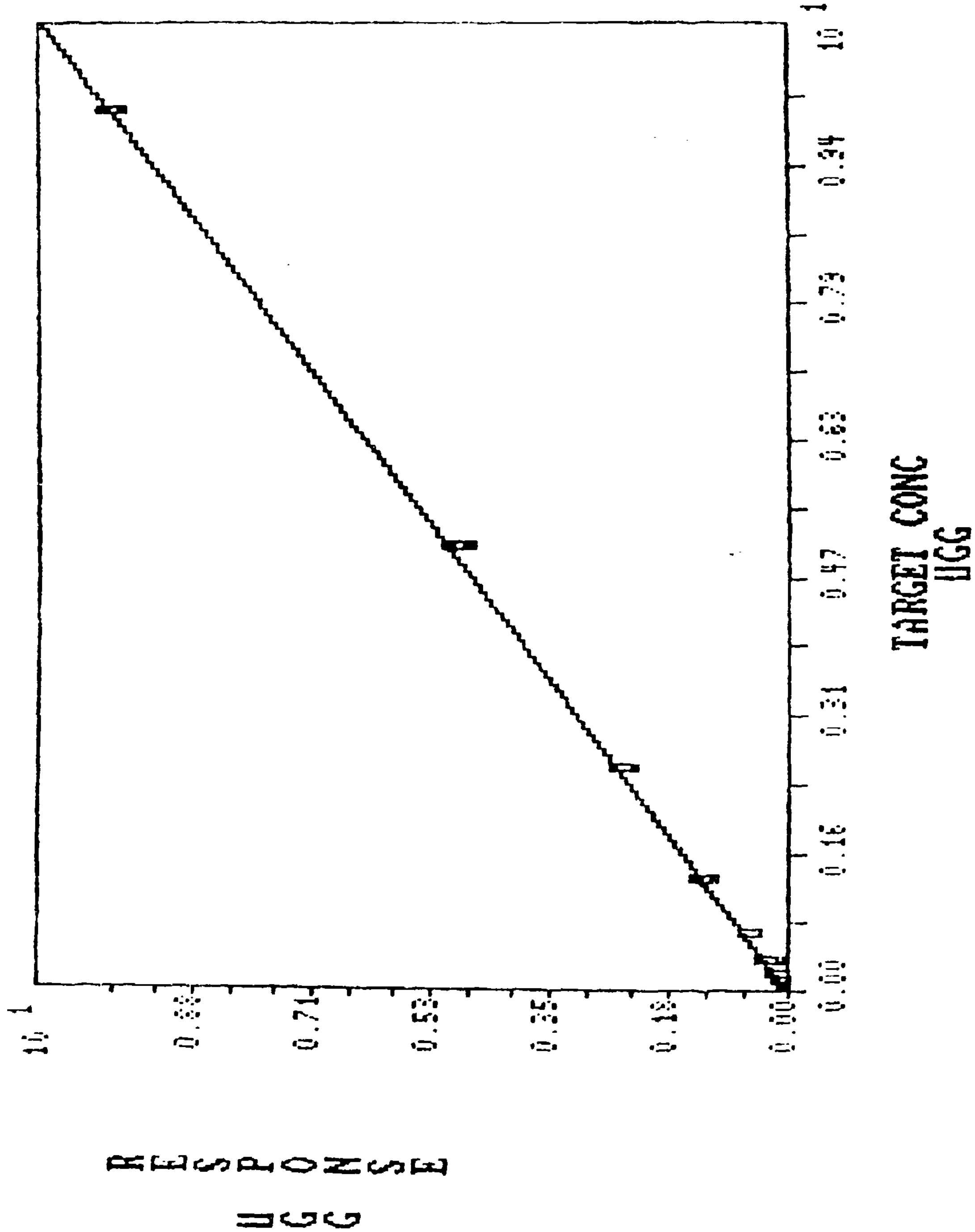
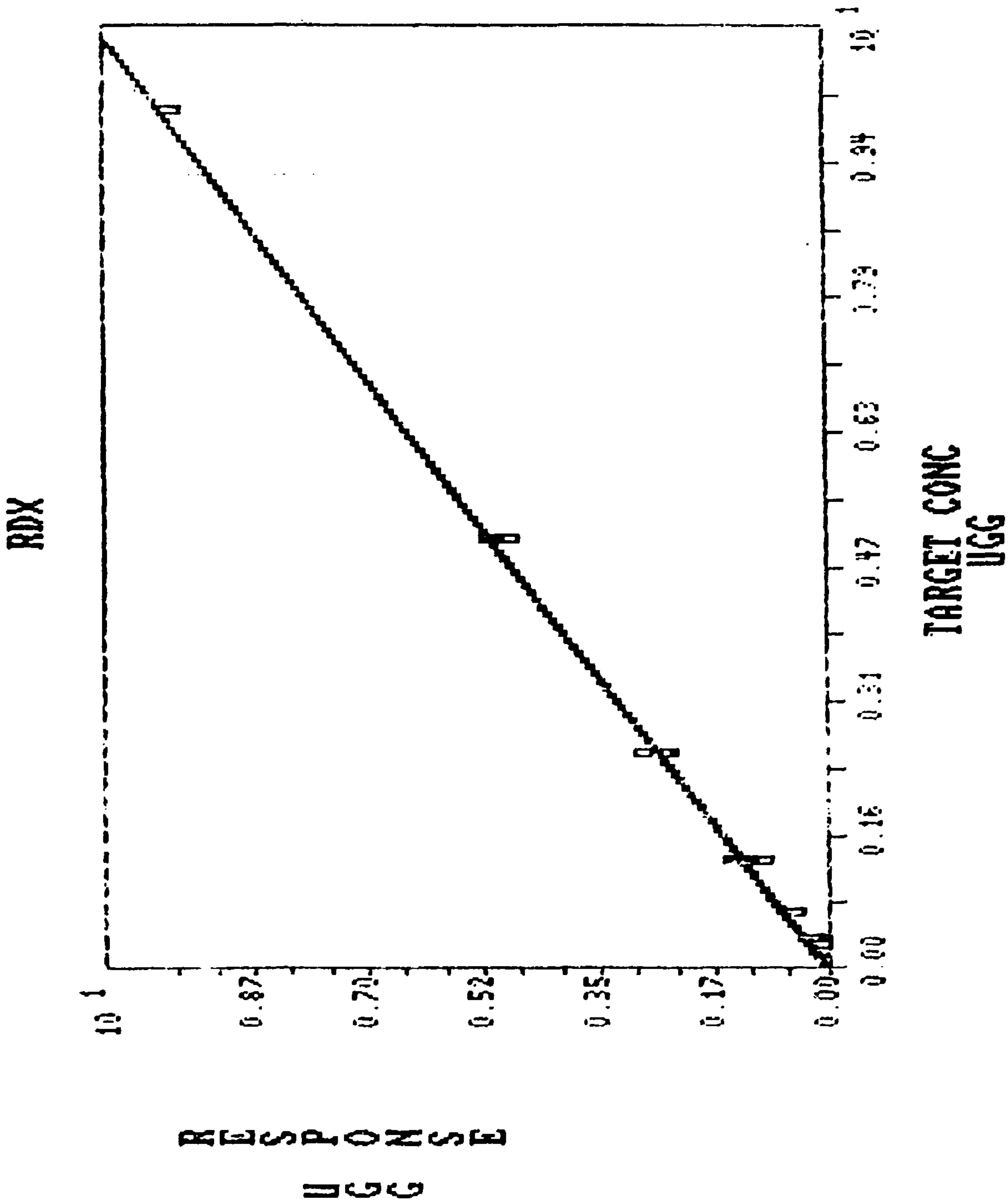


FIGURE F 19b



RDX
RESPONSE
UGG
0.00
0.17
0.35
0.52
0.70
0.87
TARGET CONC
UGG
0.00
0.47
0.63
0.94

FIGURE F 20a

TNT

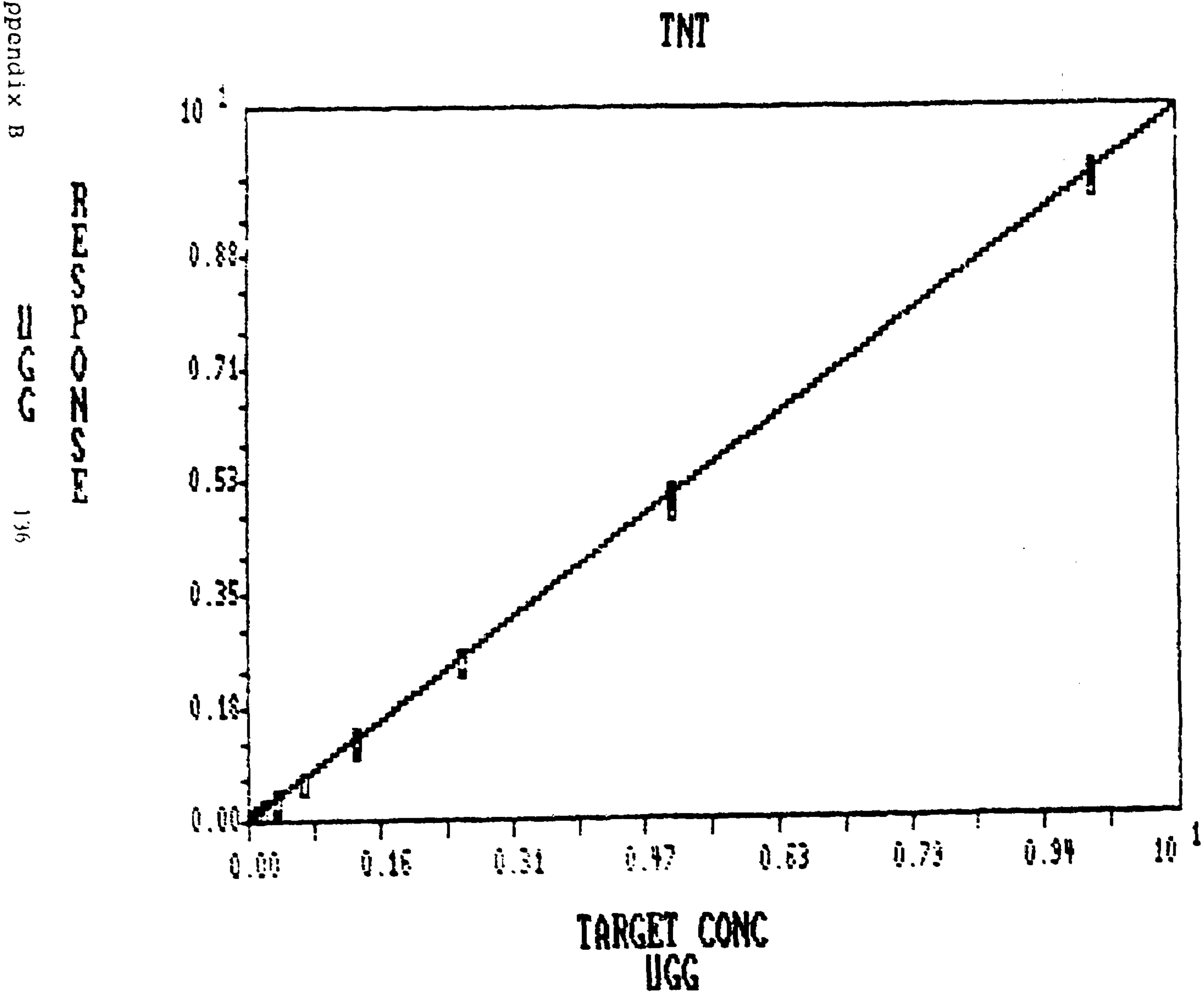


FIGURE F 20b

TNT

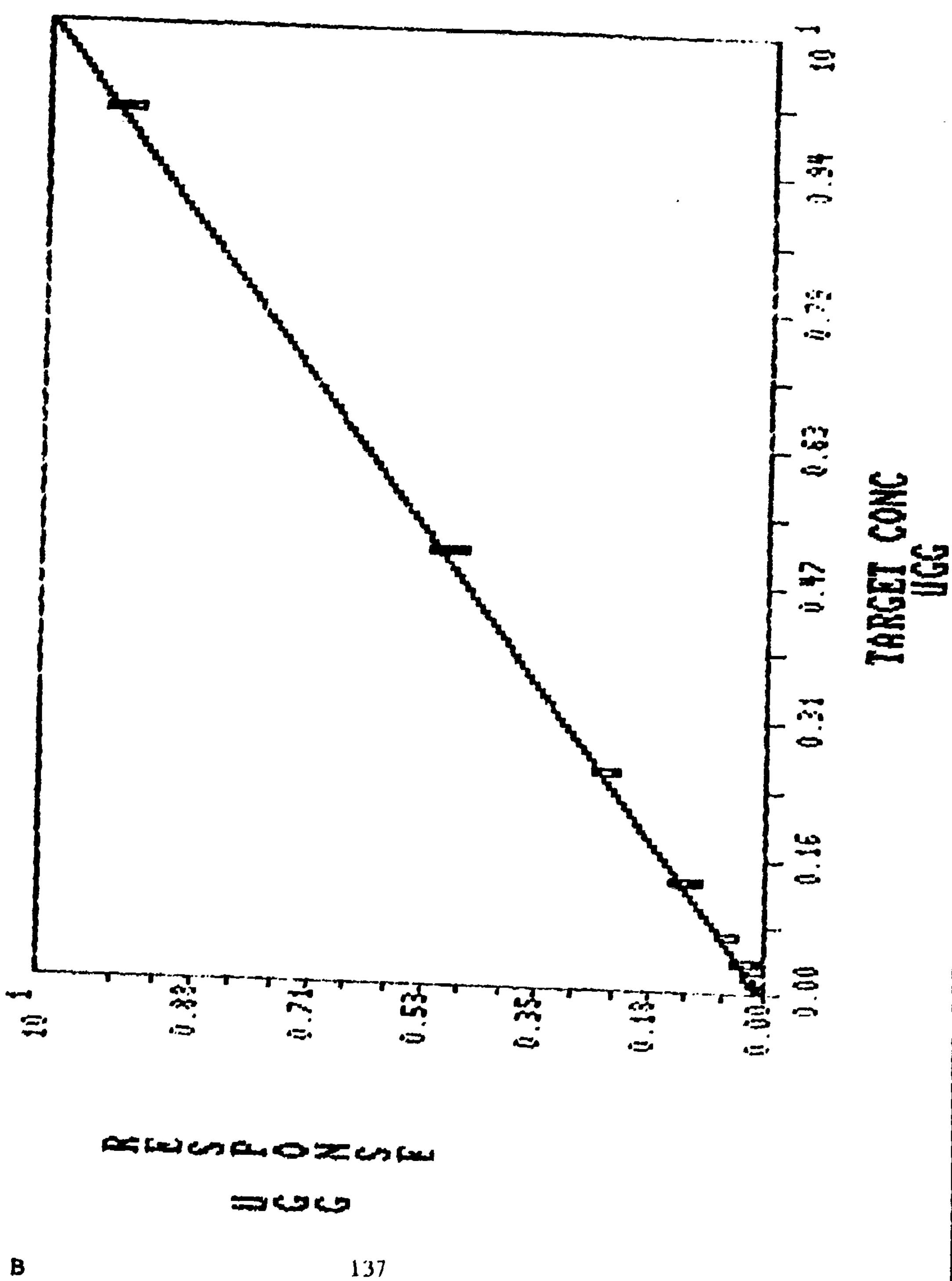


FIGURE F 21a

2,4

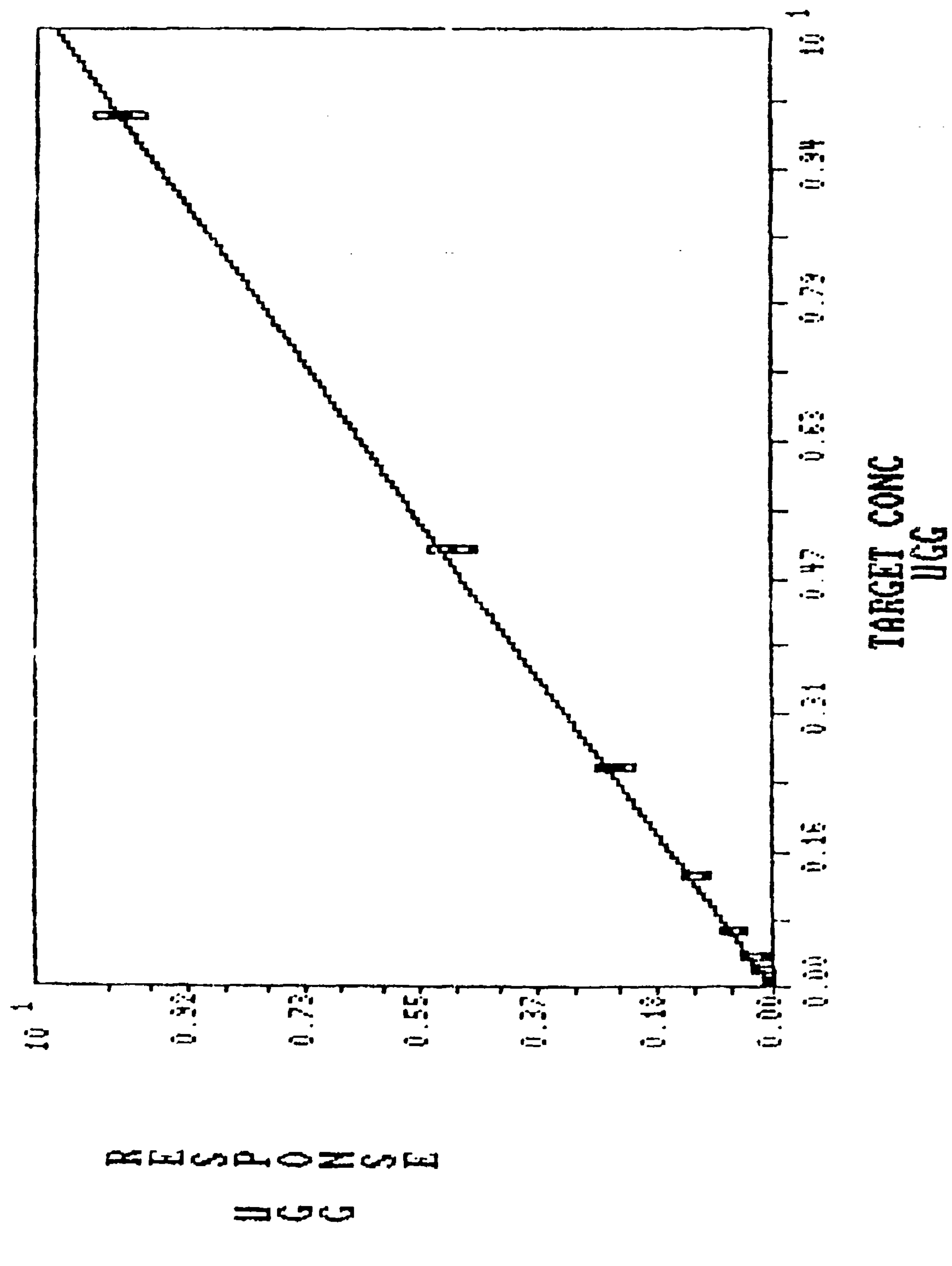
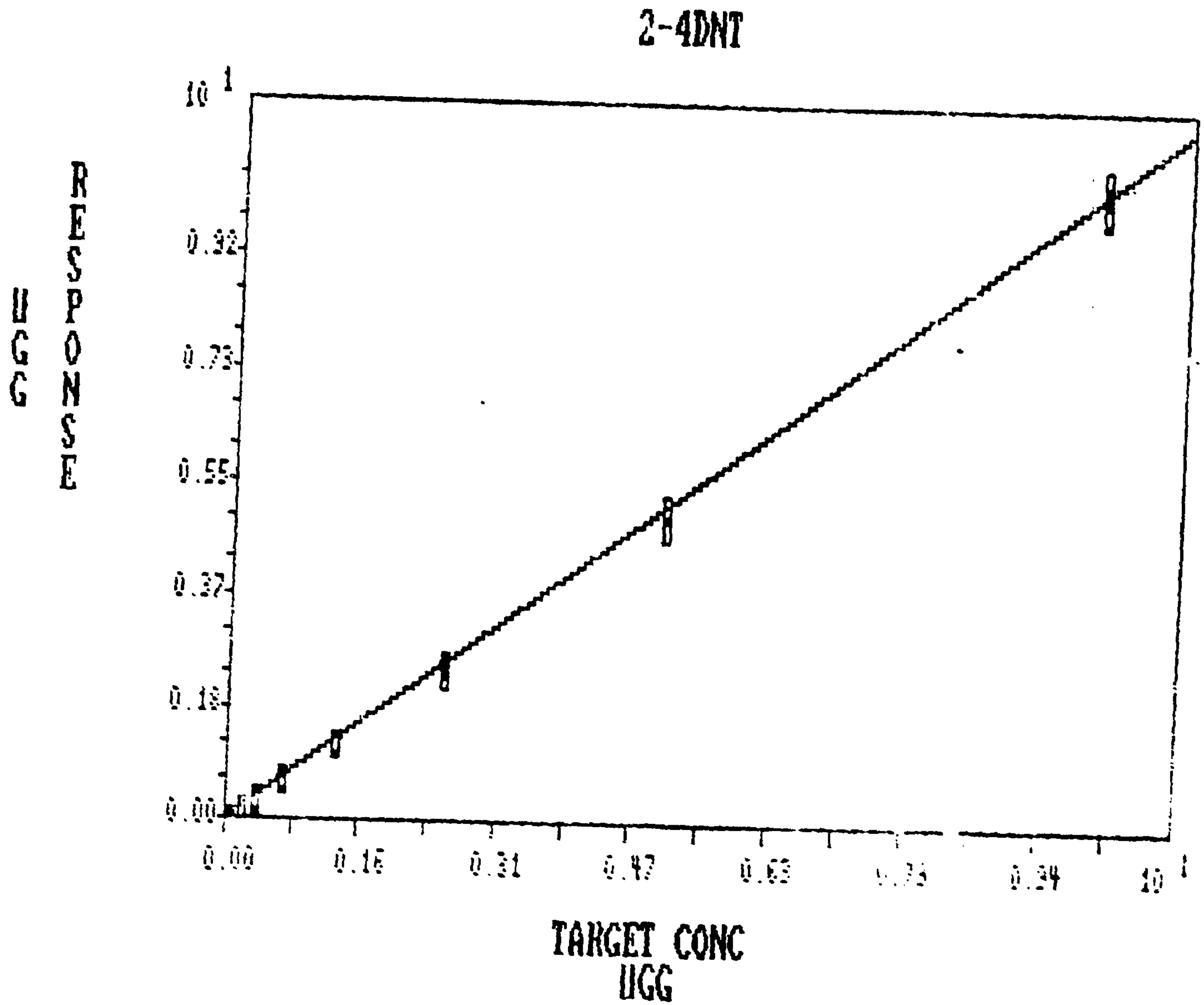


FIGURE F 21b



2-4DNT
RESPONSE
UGG
10 1
0.92
0.73
0.55
0.37
0.18
0.00
0.00
0.16
0.31
0.47
0.63
0.94
10 1
TARGET CONC
UGG

FIGURE F 22a

2,6

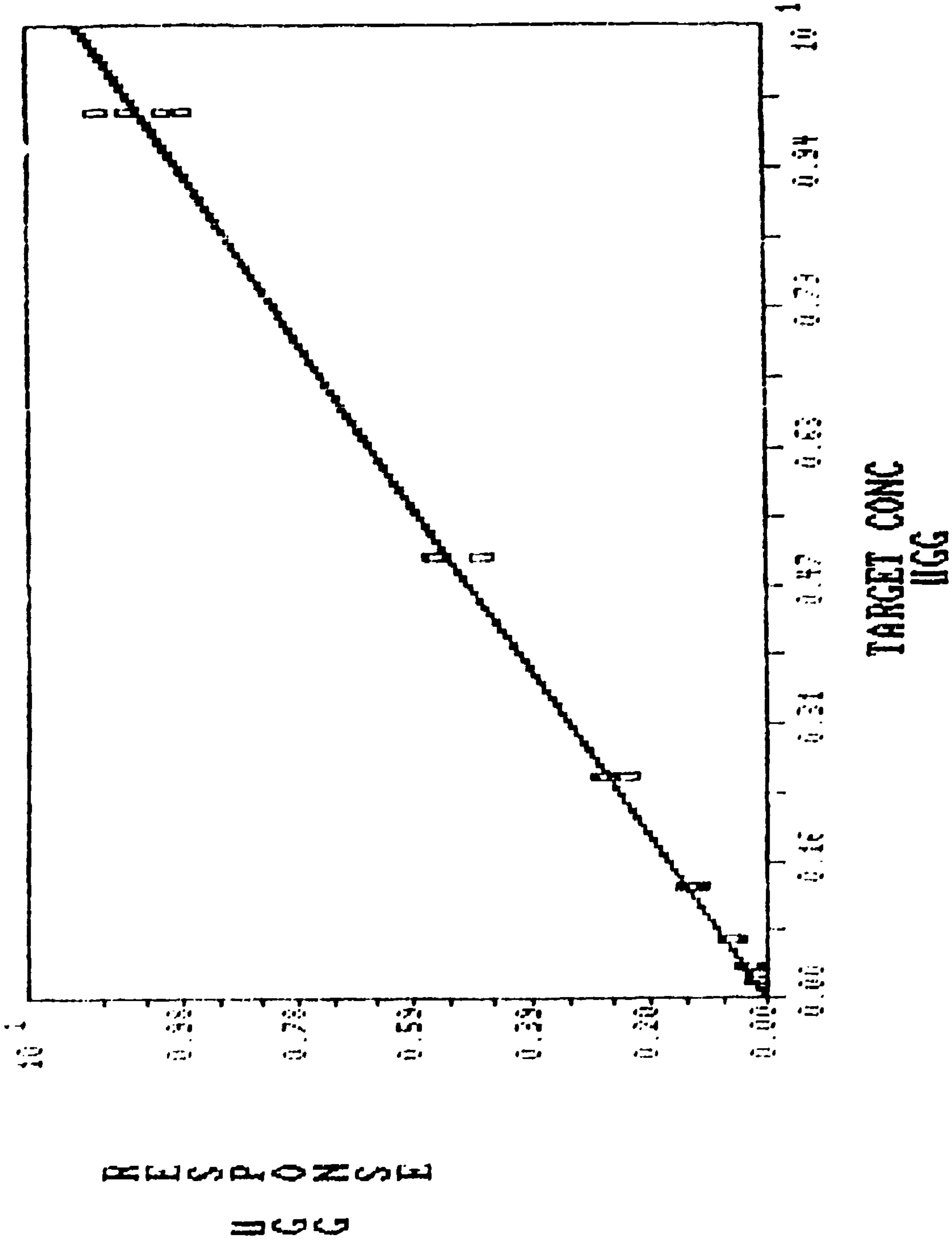


FIGURE F 22b

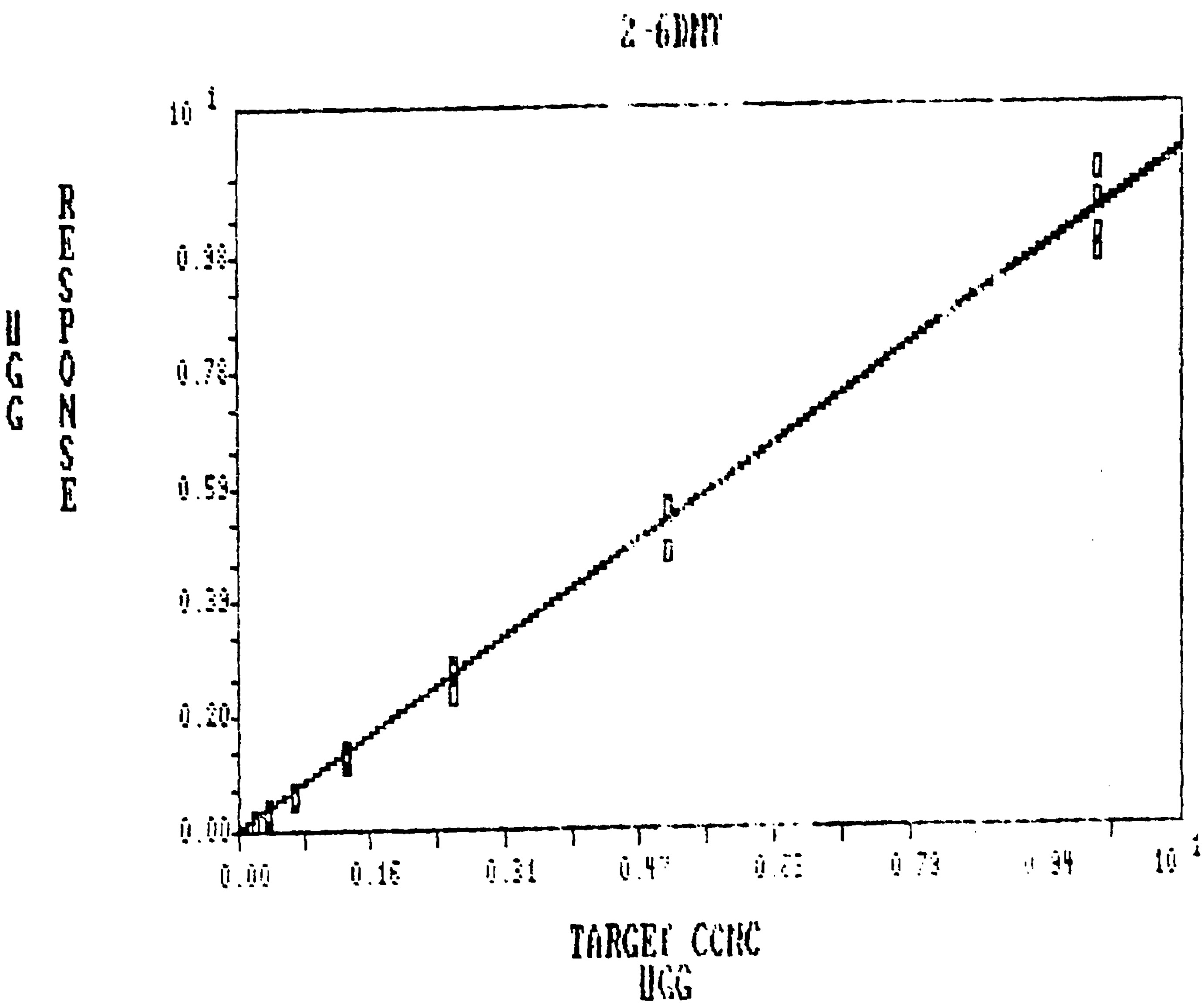

2-6DNT
RESPONSE
UGG
TARGET CONC
UGG
0.00
0.16
0.31
0.47
0.73
10
0.20
0.53
0.78

FIGURE F 23a

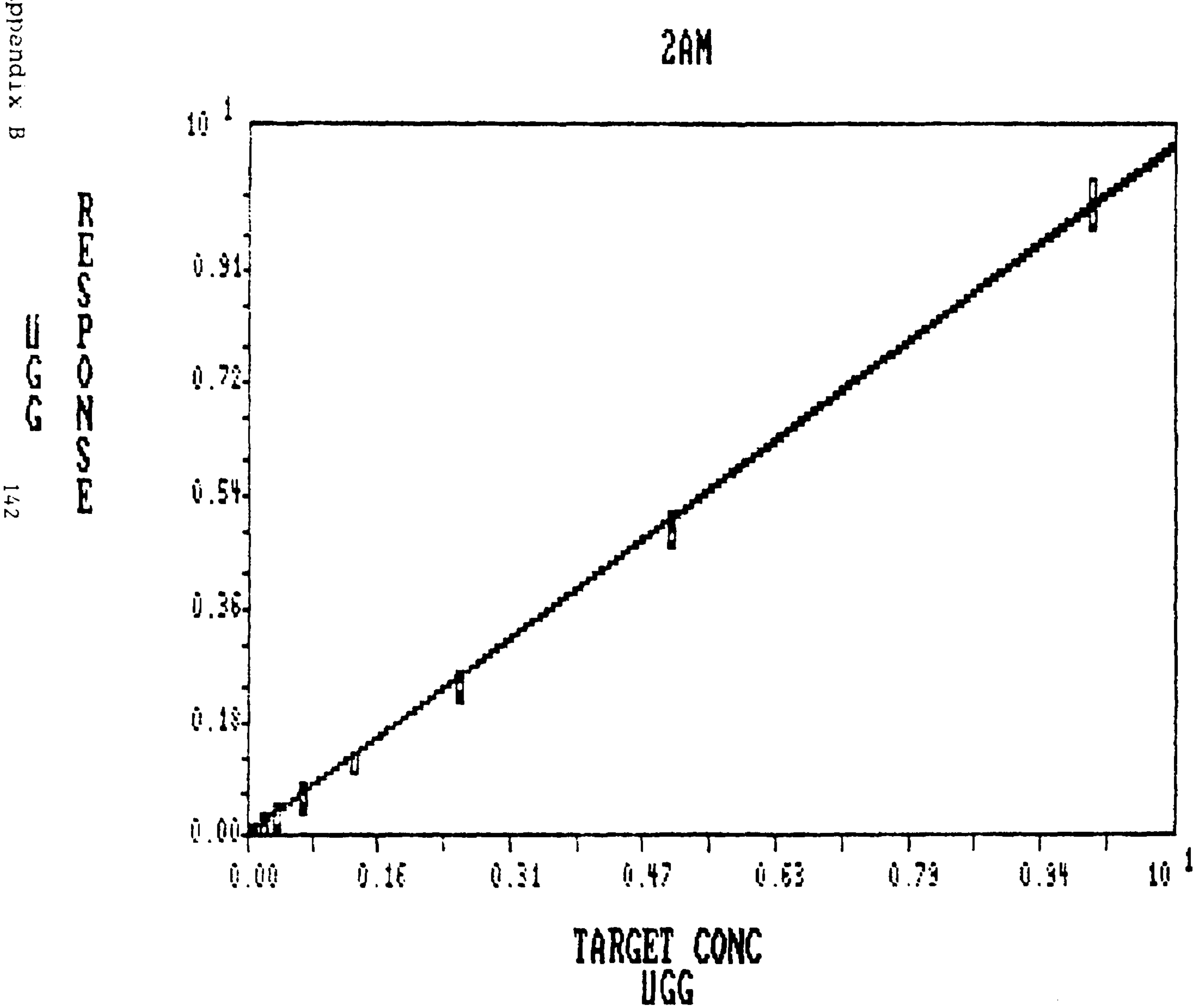

2AM
RESPONSE
UGG
10 1
0.91
0.72
0.54
0.36
0.18
0.00
0.00
0.16
0.31
0.47
0.63
0.79
0.94
10 1
TARGET CONC
UGG

FIGURE F 23b

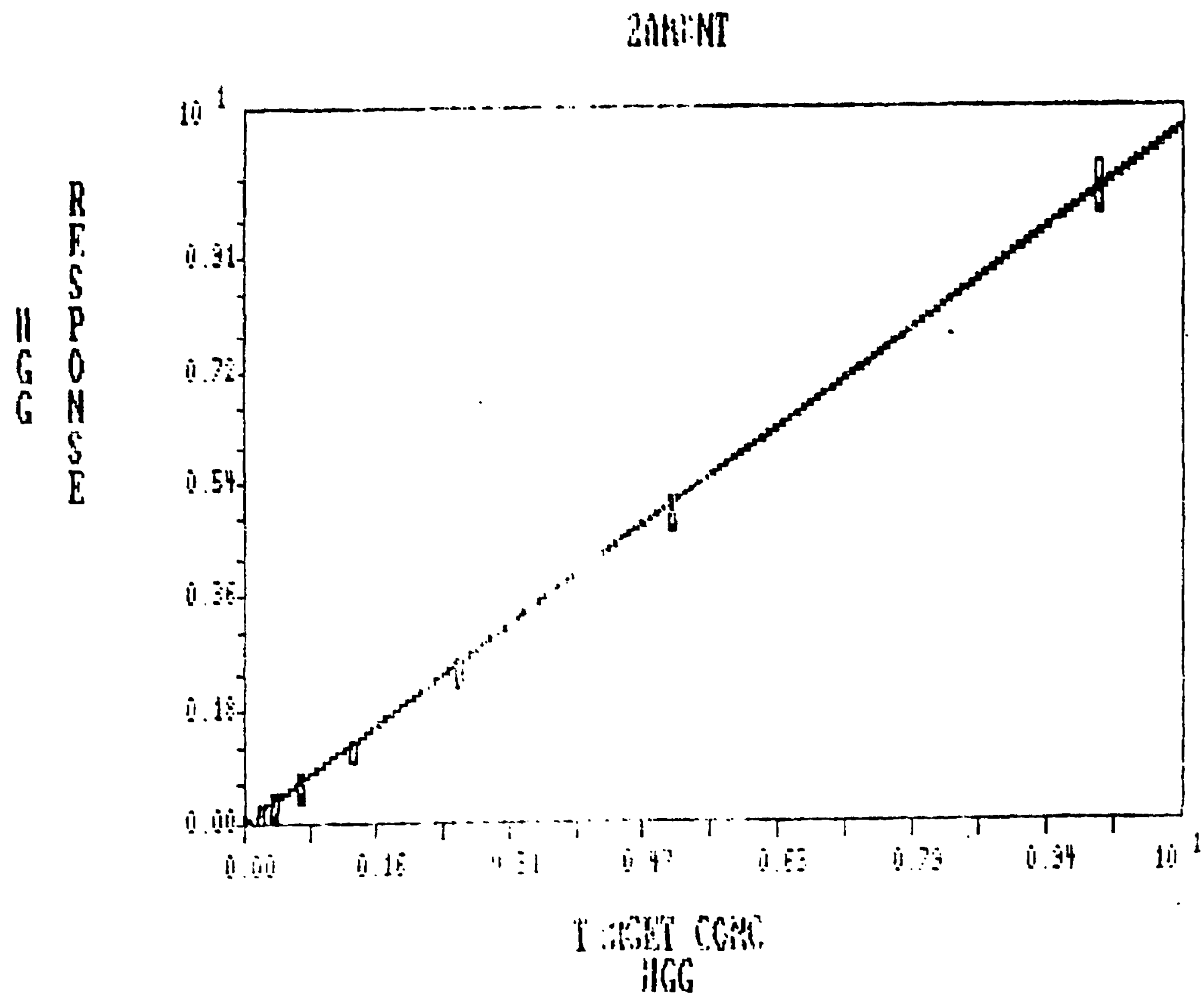


FIGURE F 24a

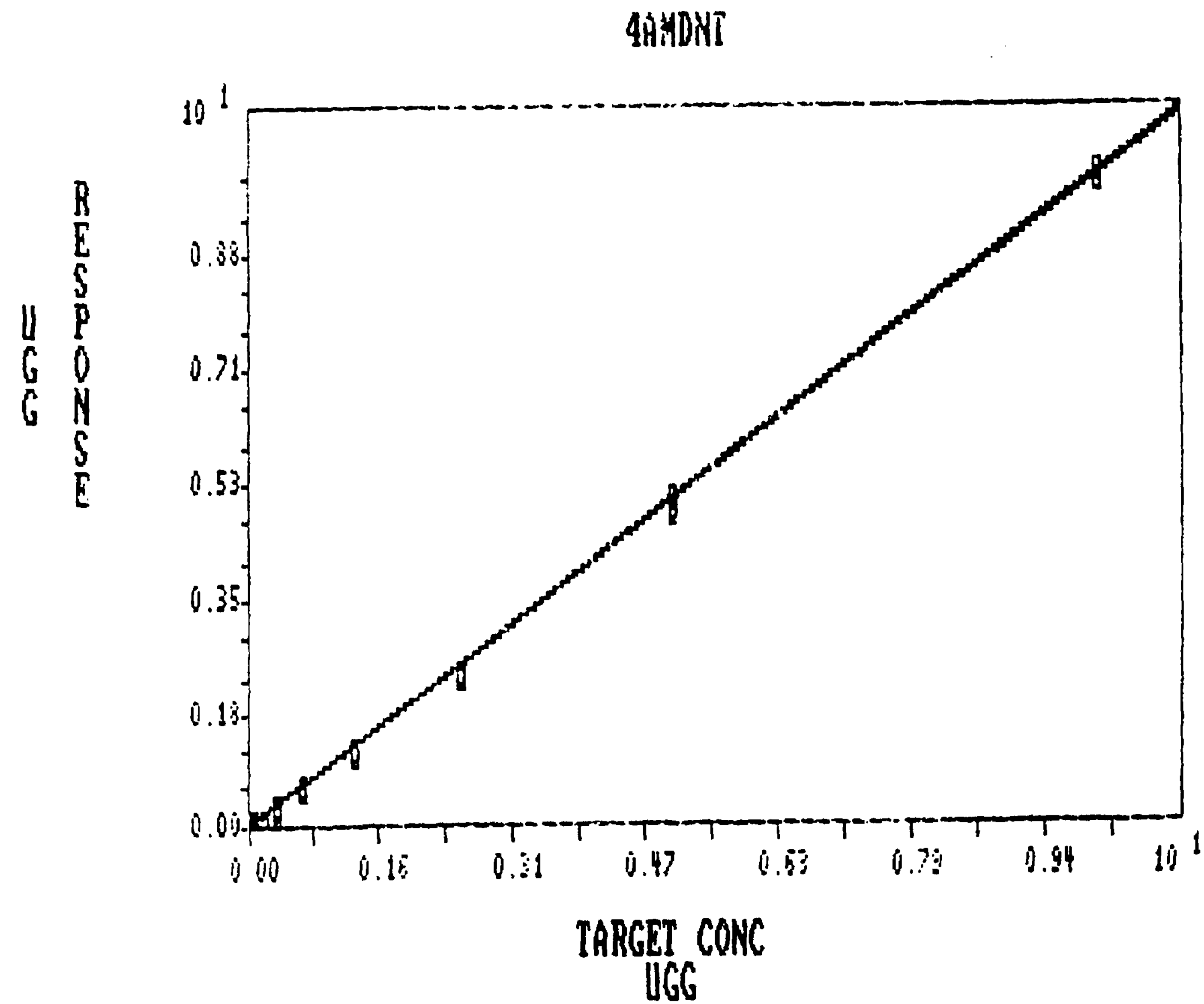

4AMDNT
RESPONSE
UGG
10 1
0.88
0.71
0.53
0.35
0.18
0.00
0.00
0.16
0.31
0.47
0.63
0.79
0.94
10 1
TARGET CONC
UGG

FIGURE F 24b

4AMDNT

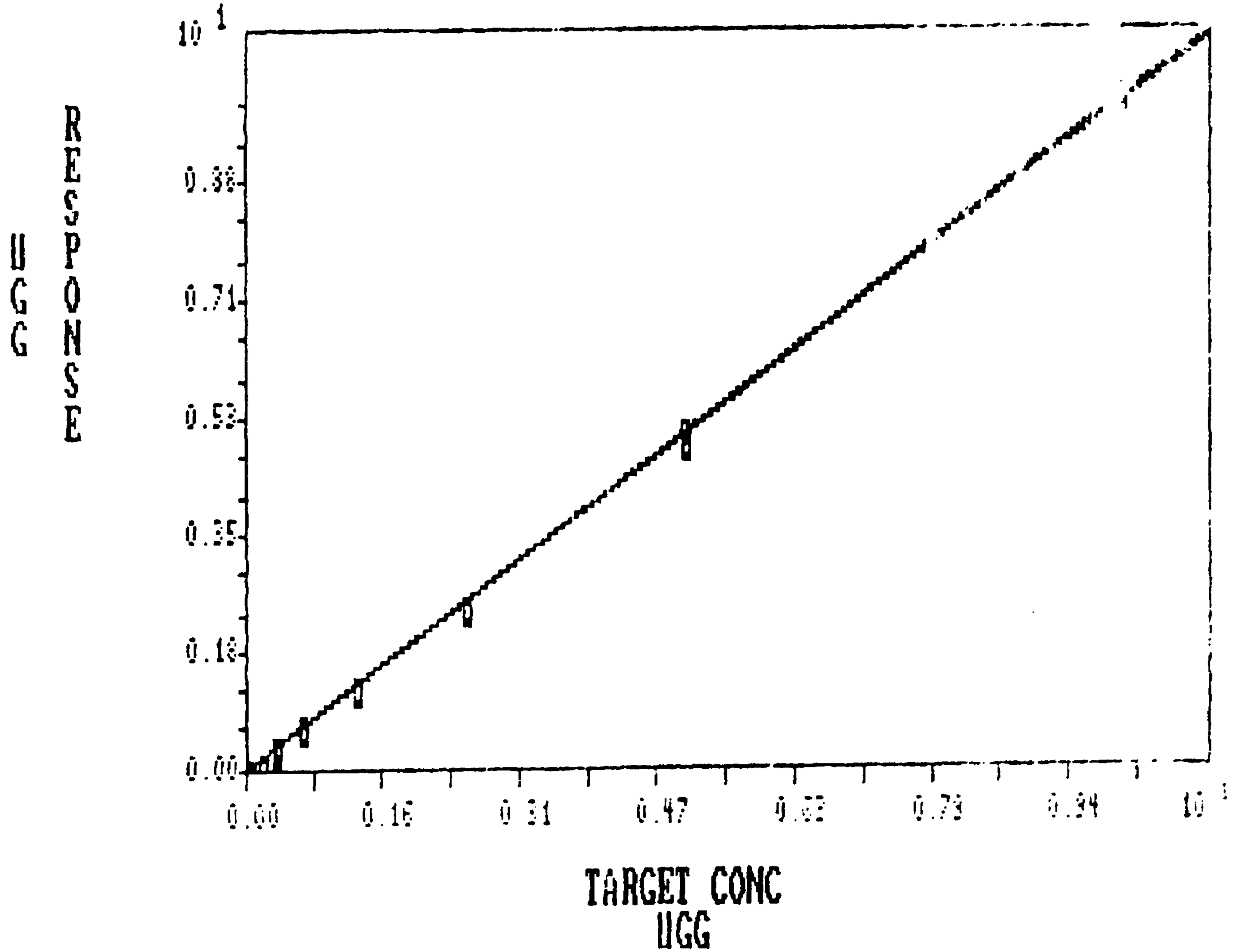


Figure F 25a

HMX

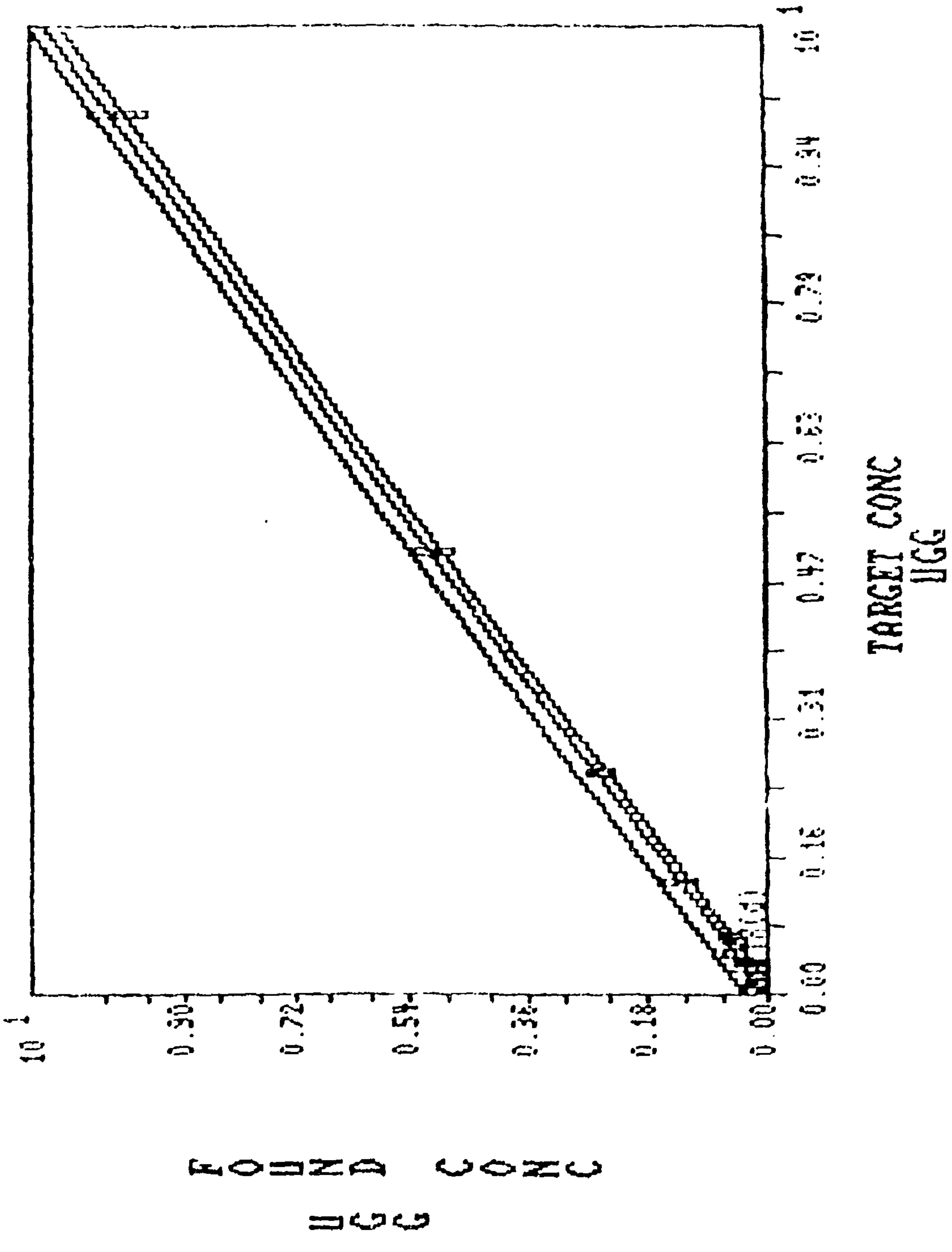


FIGURE F 25b

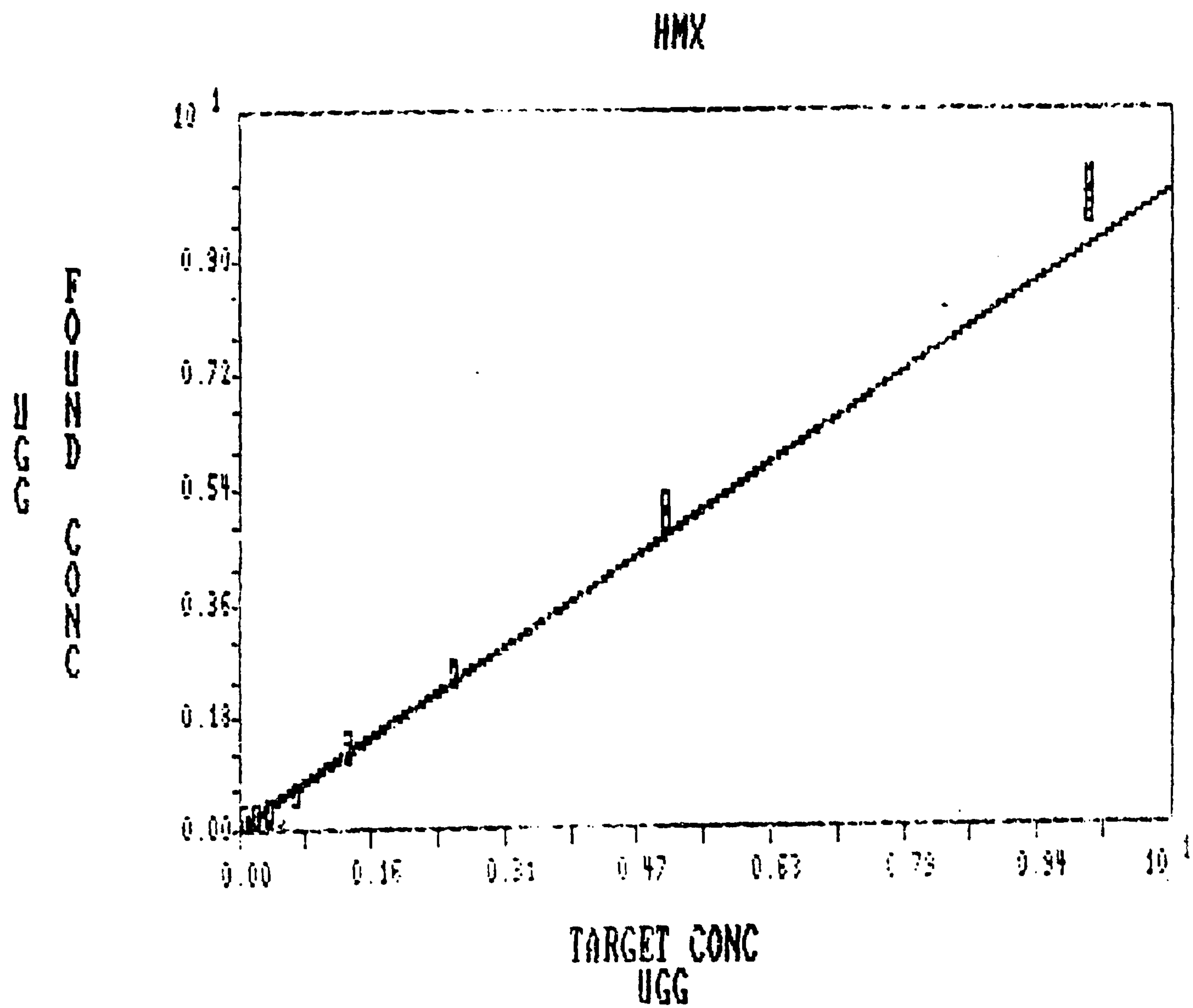

HMX
FOUND CONC
UGG
10 1
0.90
0.72
0.54
0.36
0.18
0.00
0.00
0.16
0.31
0.47
0.63
0.94
10 1
TARGET CONC
UGG

FIGURE F 26a

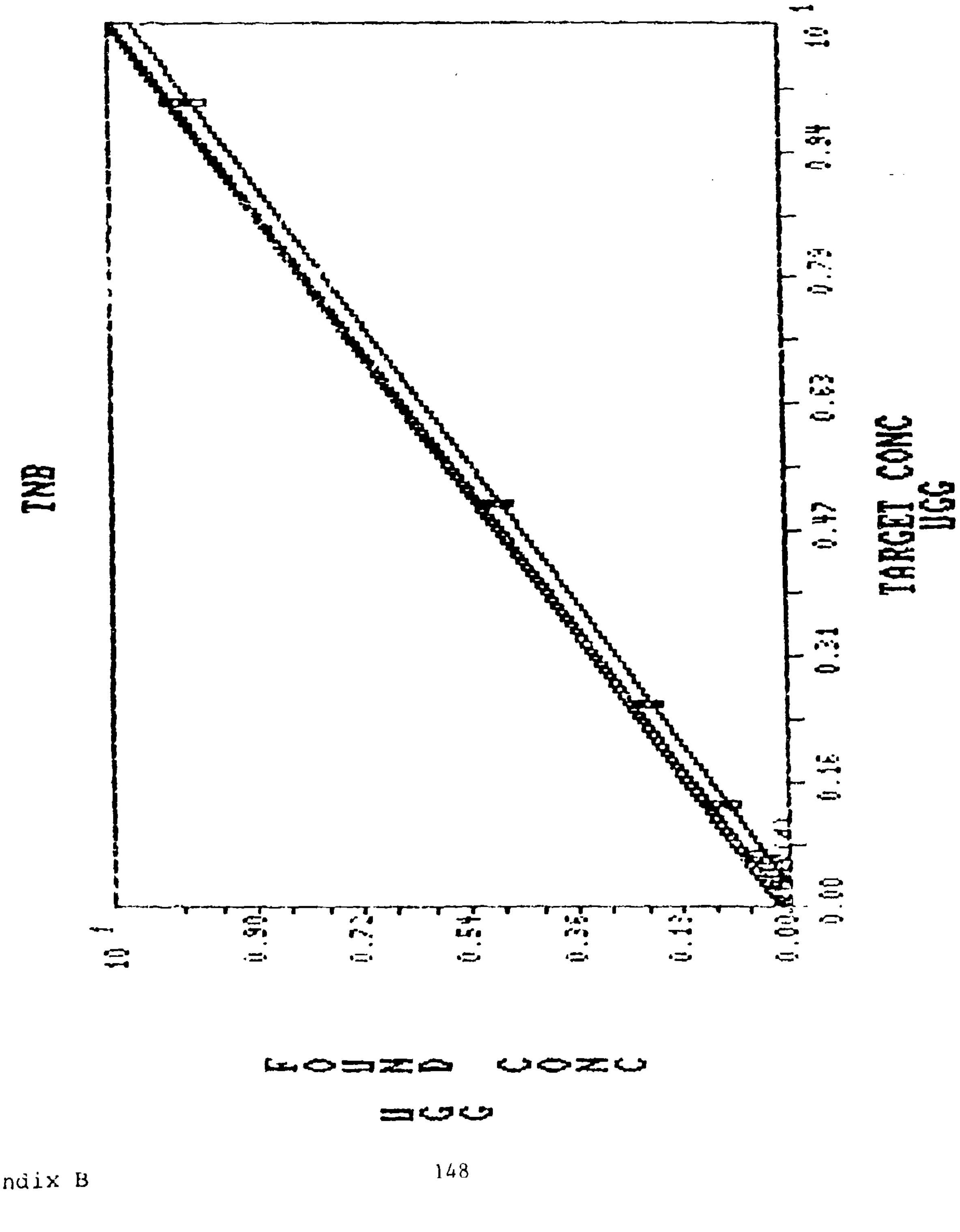


FIGURE F 26b

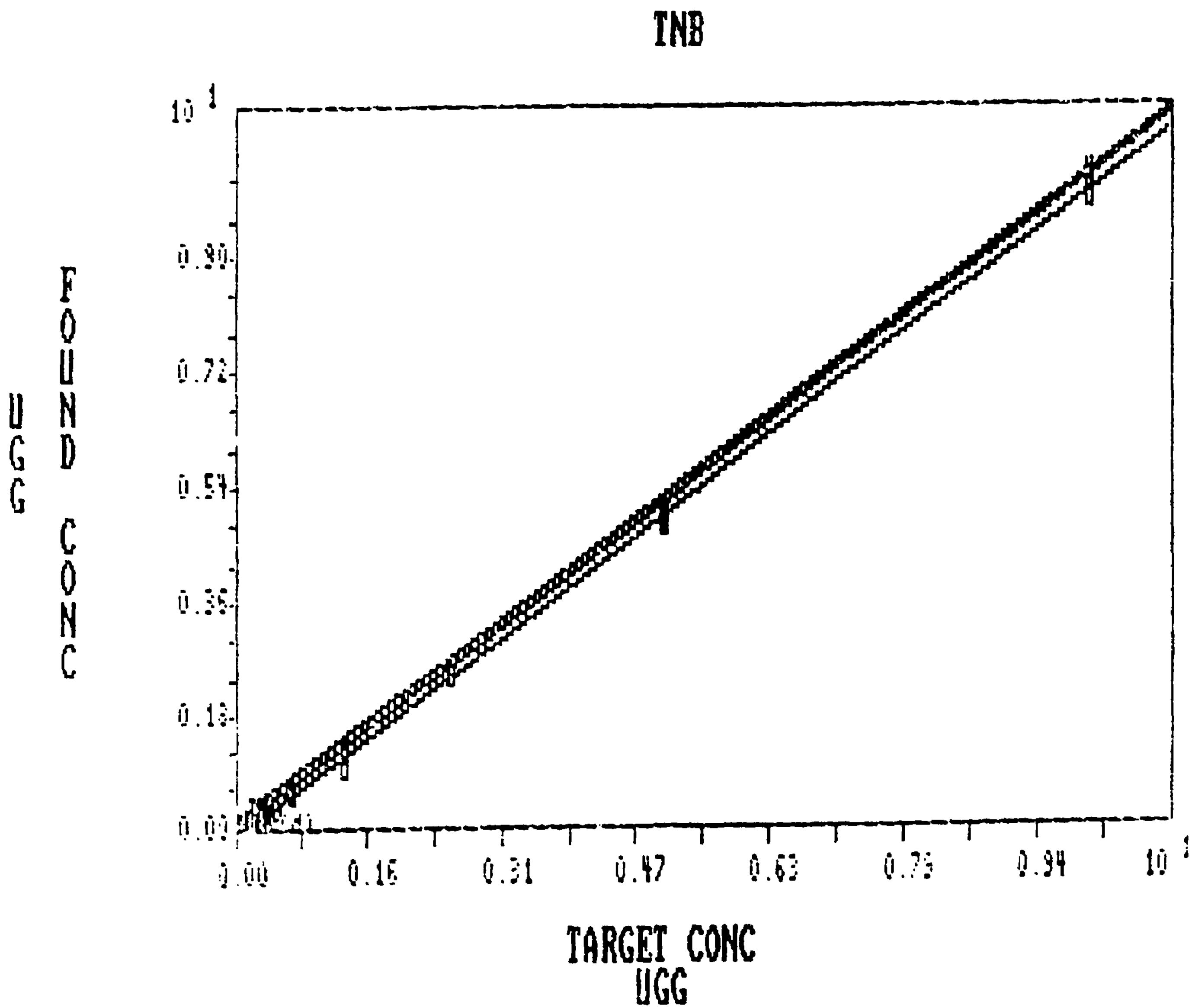


FIGURE F 27a

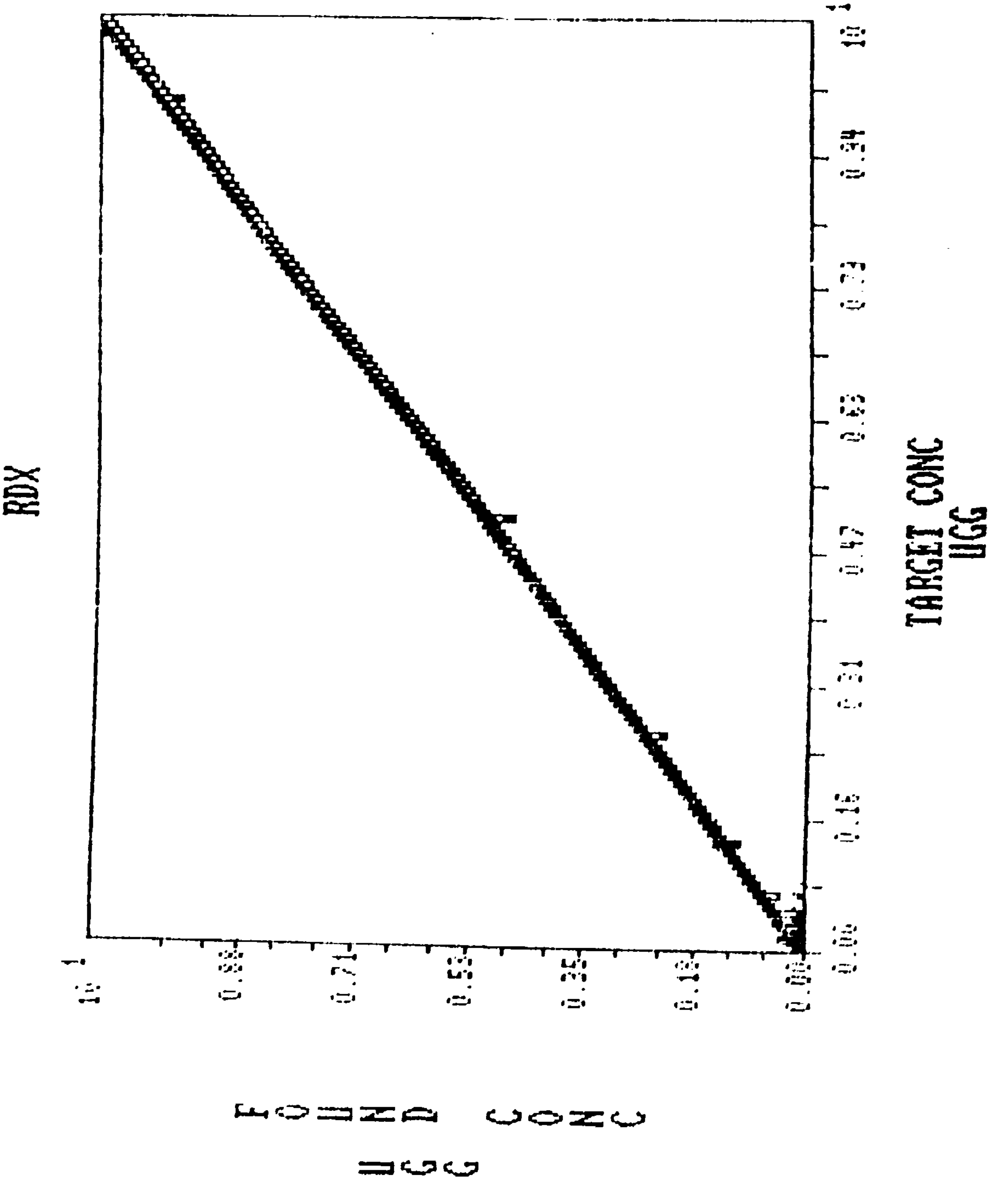
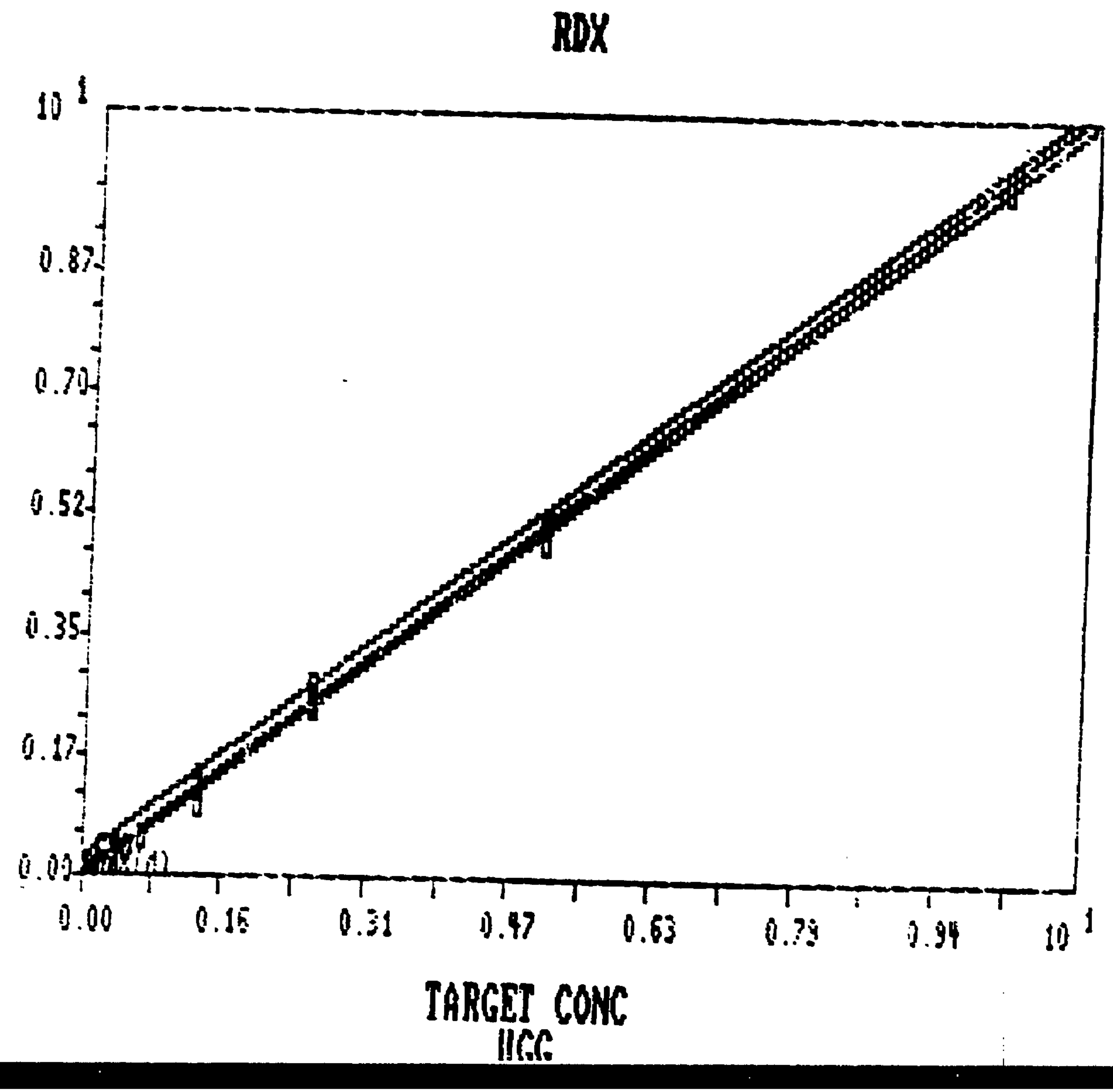


FIGURE F 27b



RDX
10 1
0.87
0.70
0.52
0.35
0.17
0.00
0.00
0.16
0.31
0.47
0.63
0.79
0.94
10 1
TARGET CONC
UGG
FOUND CONC
UGG

FIGURE F 28a

TNT

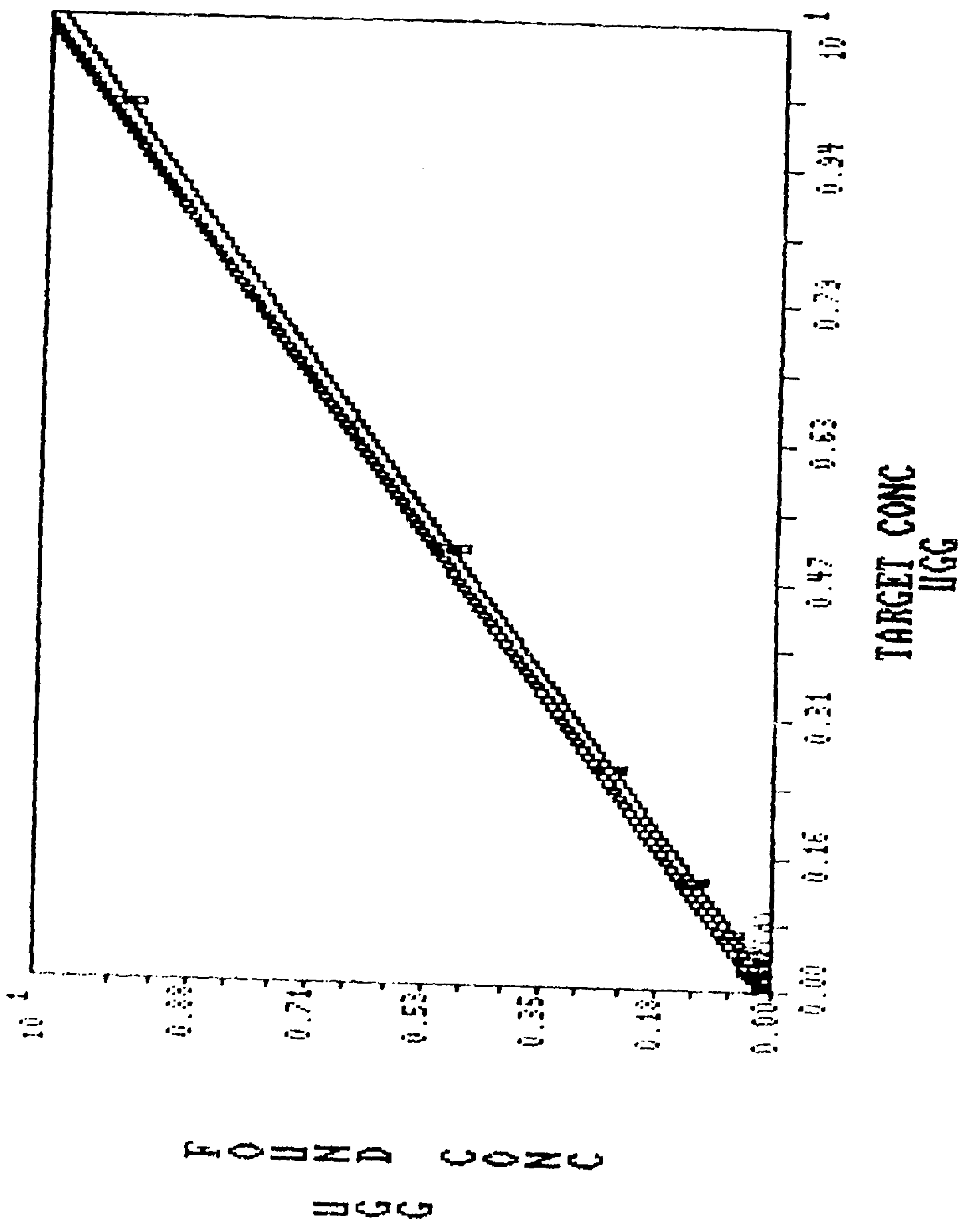
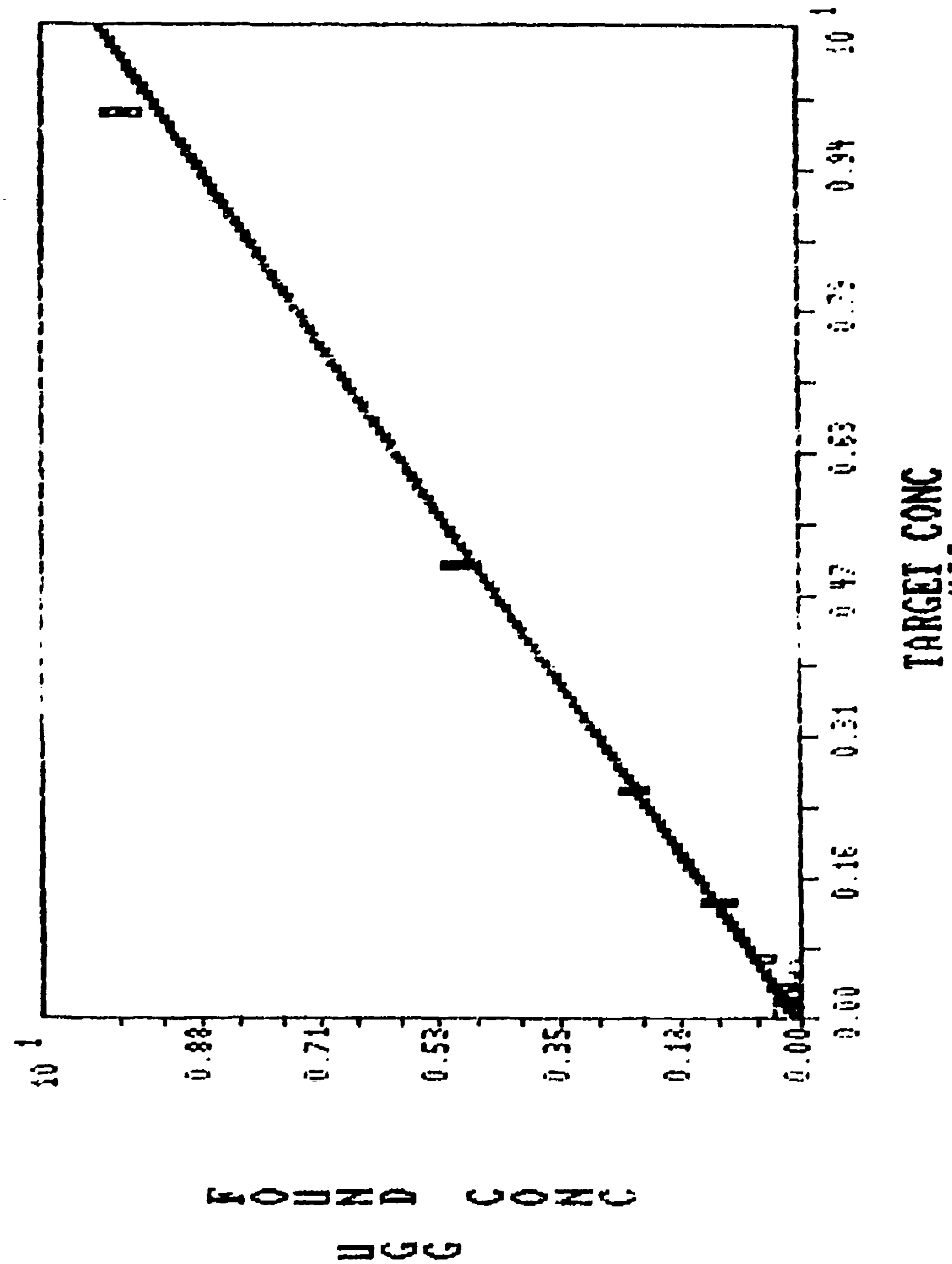


FIGURE F 28b

TNT



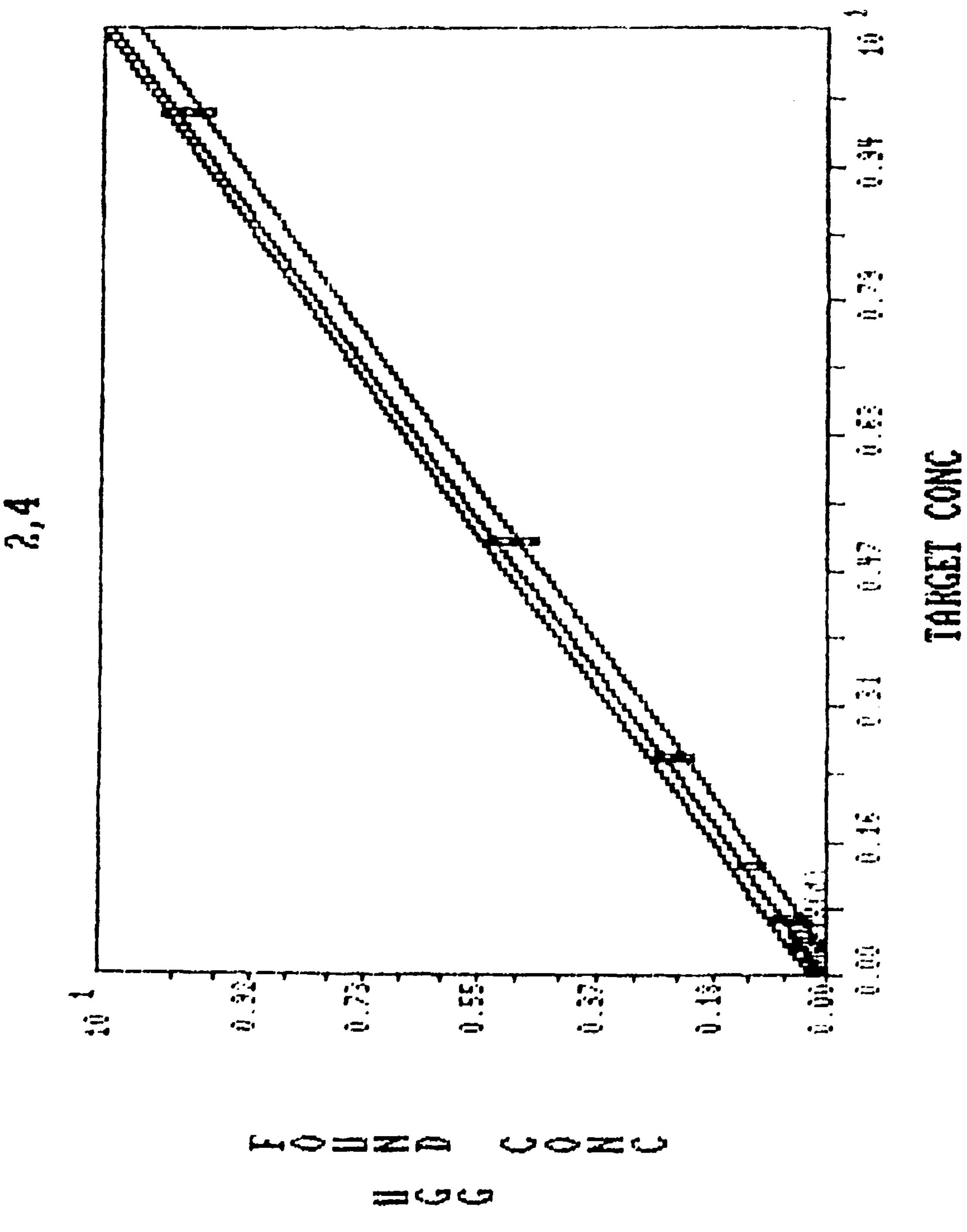

2,4
TARGET CONC
UGG
FOUND CONC
UGG

FIGURE F 29b

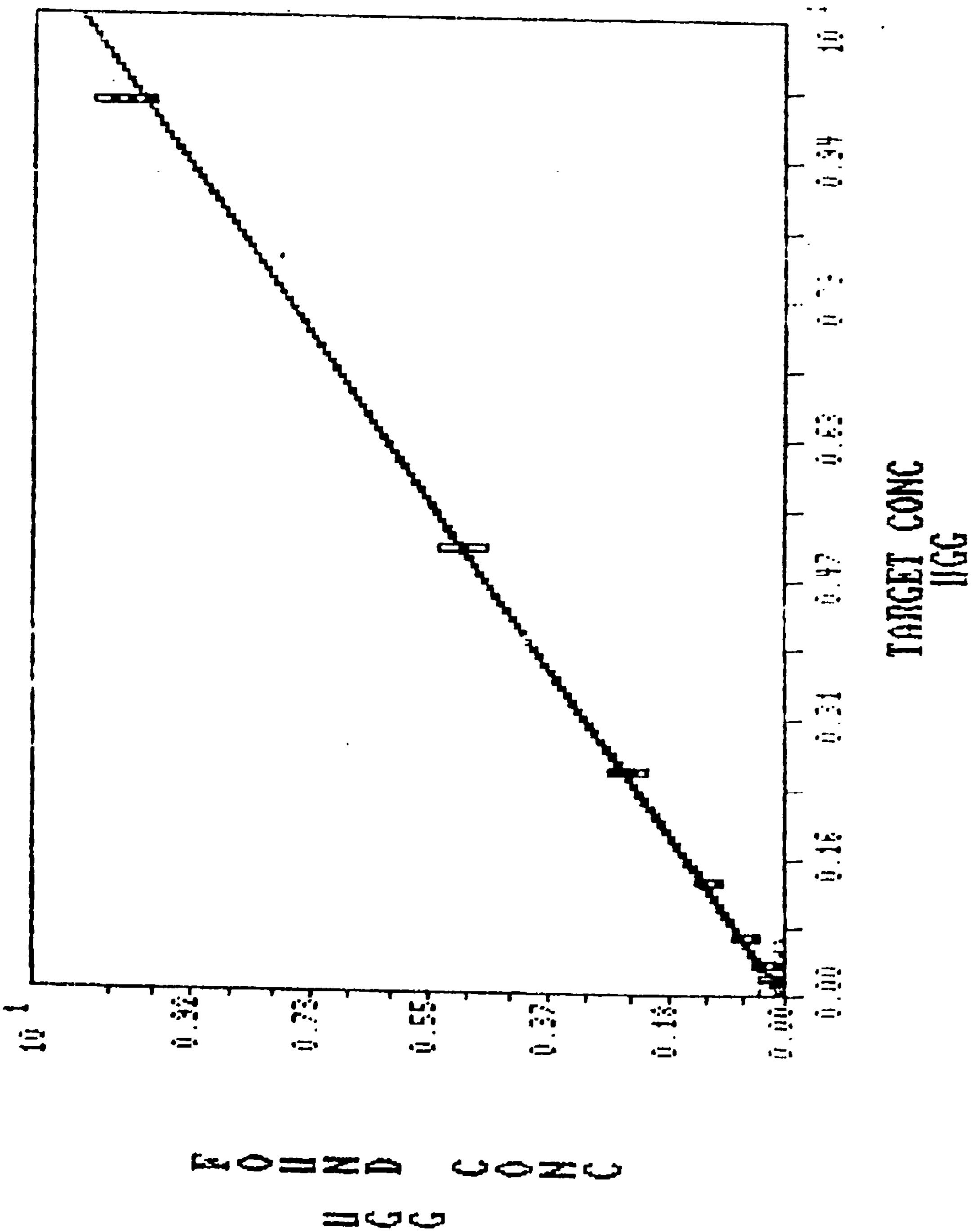


FIGURE F 30a

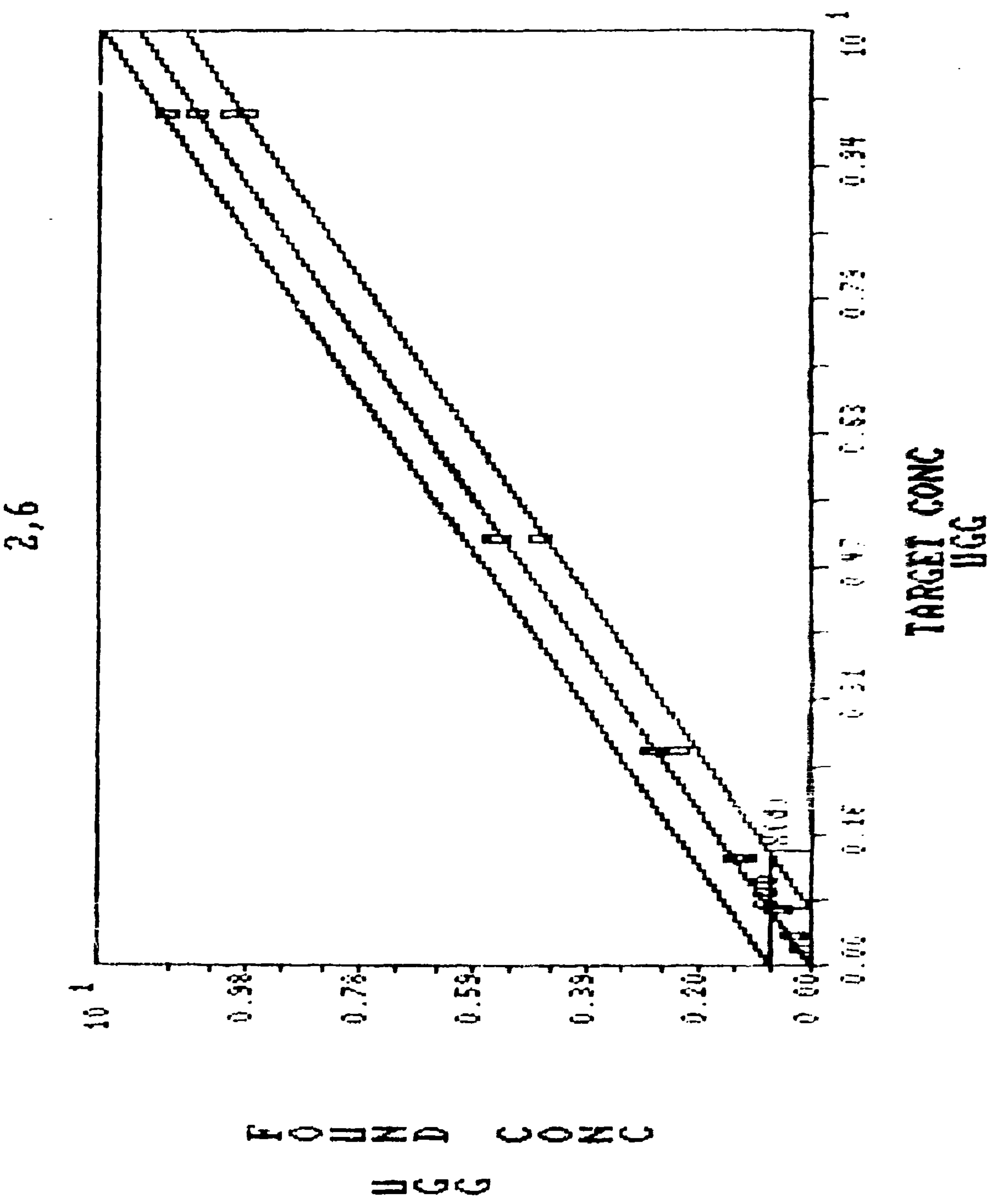


FIGURE F 30b

2-6DNT

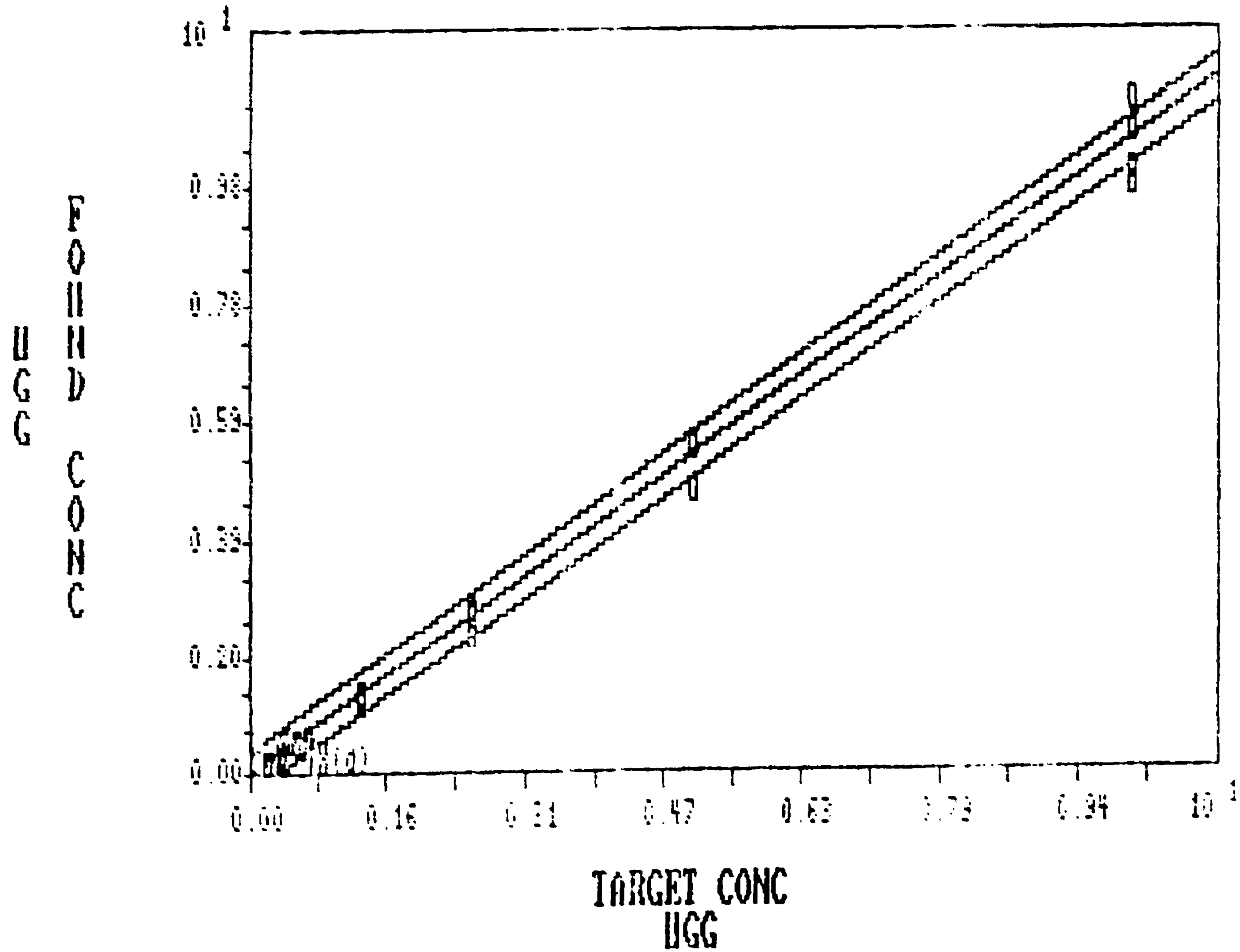


FIGURE F 31a

2AM

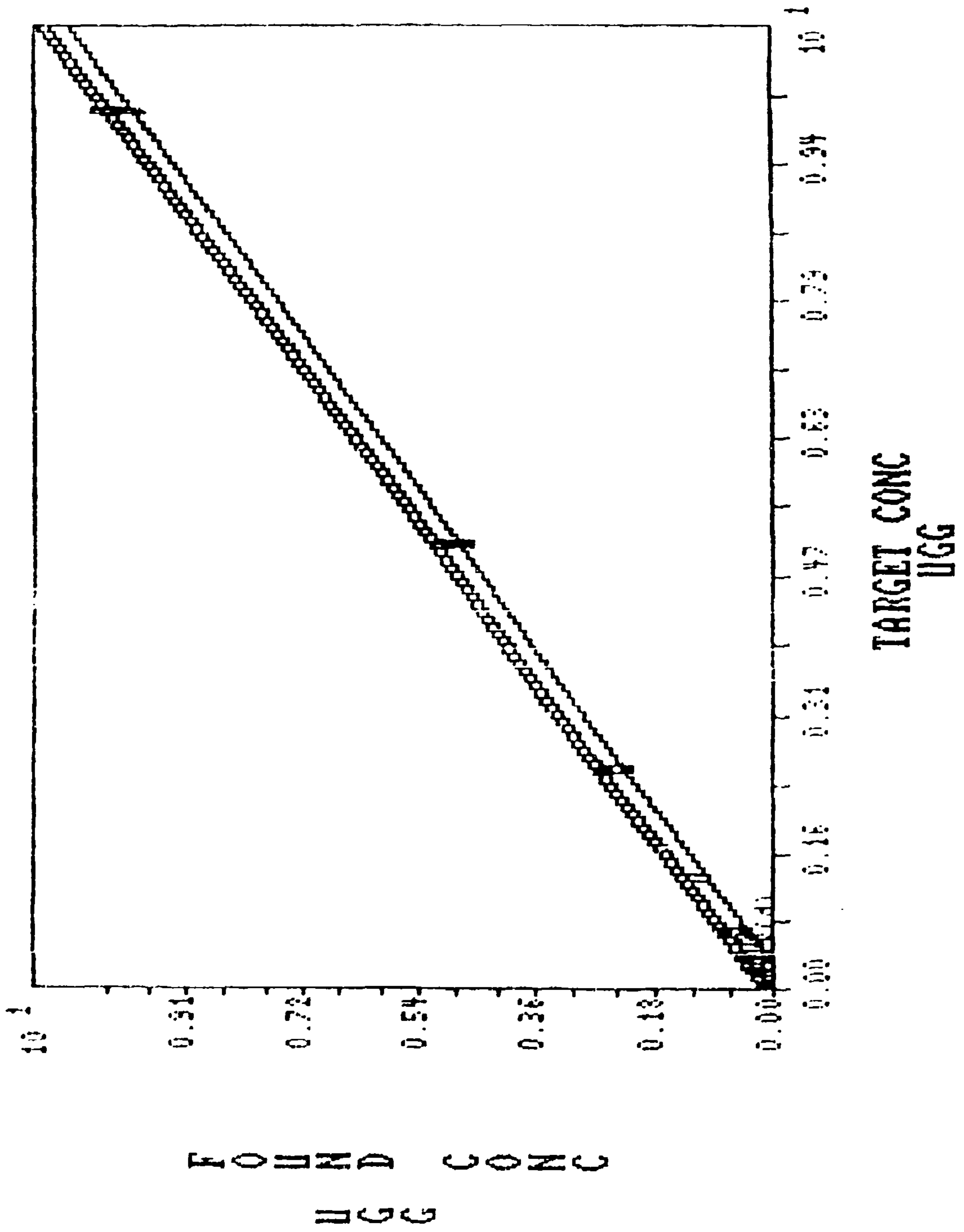


FIGURE F 31b

2AMDNT

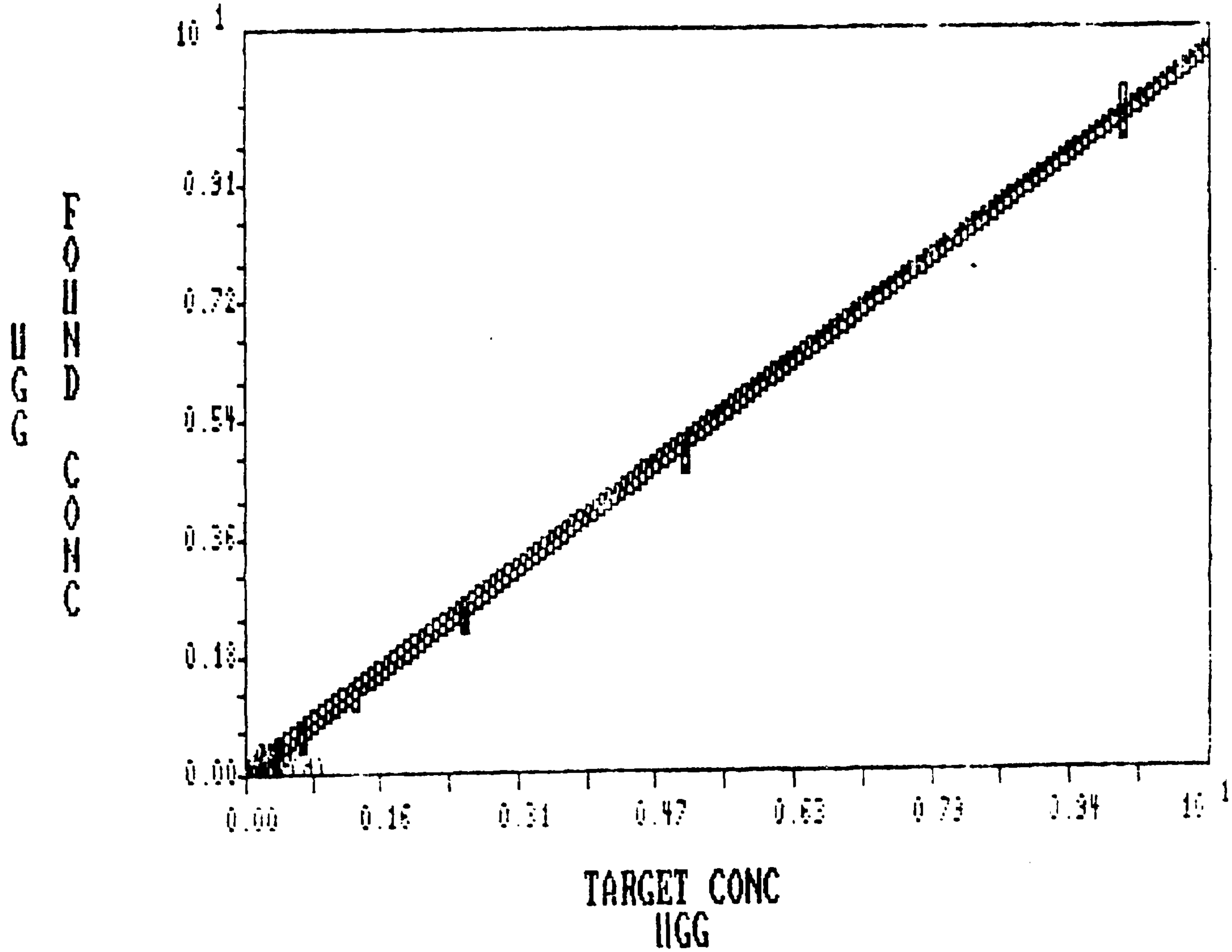


FIGURE F 32a

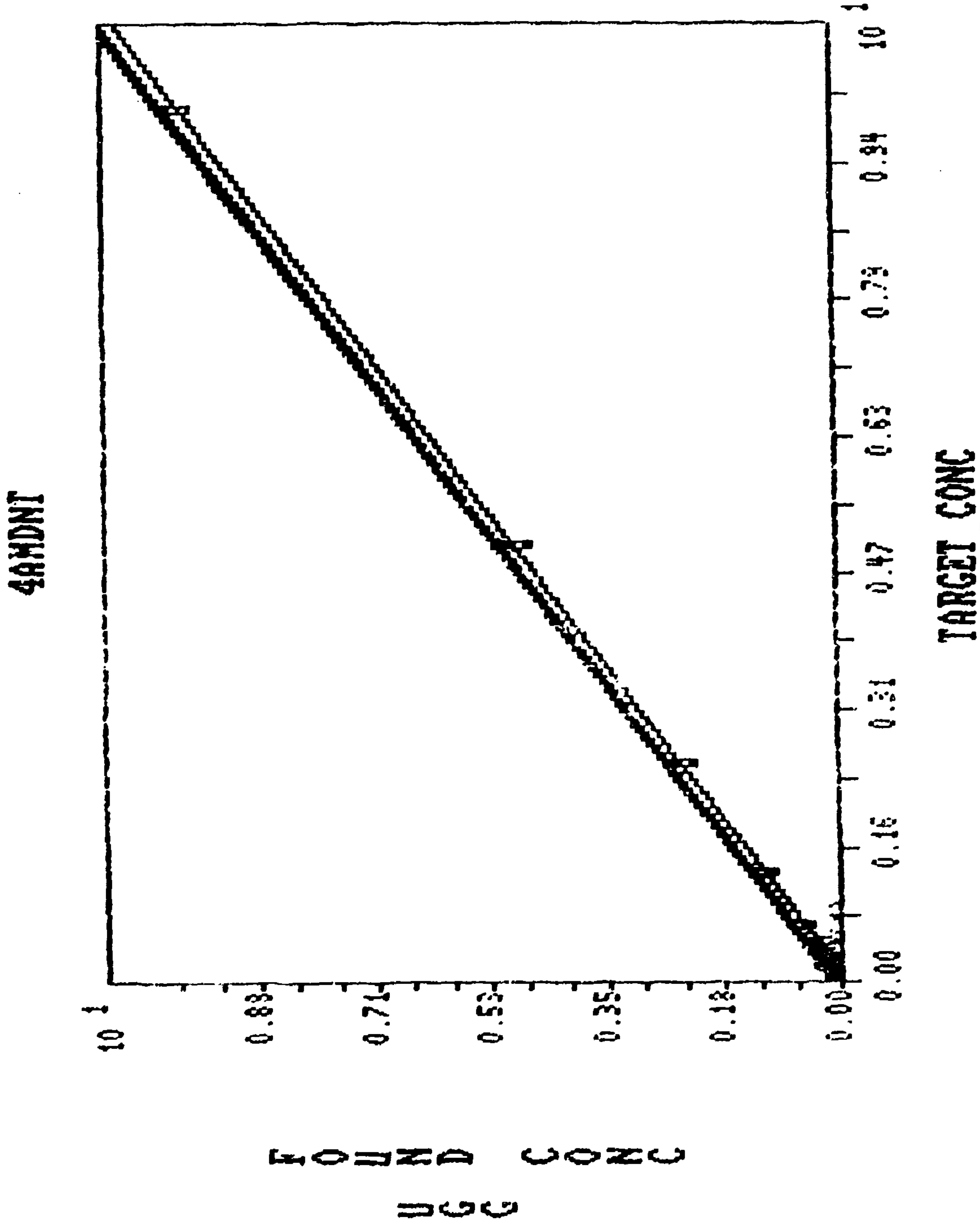


FIGURE F 32b

4AMDNT

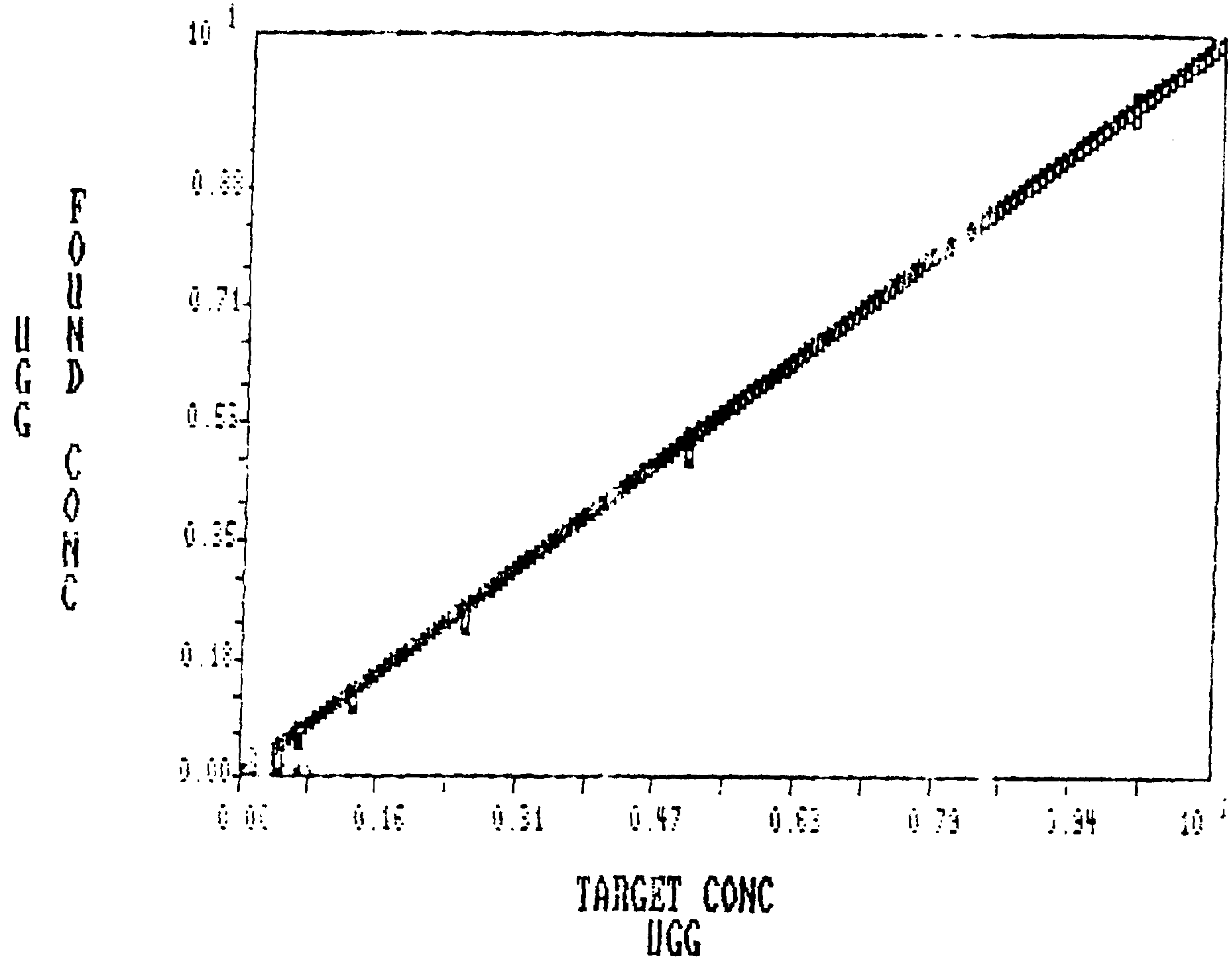


TABLE F18
CRITERION OF DETECTION WATER AND SOLVENT (mg/L)

COMPOUND	CD-R	CD-M
HMX	0.14	0.14
TNB	0.13	0.15
RDX	0.17	0.07
DNB	0.15	0.15
TNT	0.09	0.09
2,4 DNT	0.18	0.17
2,6 DNT	0.35	0.37
2-AM	0.14	0.14
4-AM	0.10	0.12

CD-R-Detection for Radford; CD-M Detection for Milan

APPENDIX C

METAL ANALYSES FOR AAD

Concentrations of selected metals were determined for soil from AAD site. Samples from uncontaminated, contaminated, and contaminated/fortified soils were extracted to determine total extractable Cd, Cr, Cu, Pb, and Zn levels. Duplicate 4-g air-dried samples were heated with 20 mL of 1.0 $\underline{M}$ HNO_3 for 3 h, filtered by gravity, and diluted to a 50-mL volume with ultrapure water (reverse osmosis followed by double deionization). All extracts were analyzed for metals by atomic absorption spectrophotometry (Perkin Elmer Model 3030 AA Spectrometer). Corresponding standard solutions, and blank, duplicate and split samples were also analyzed to assure quality control. Mean values of metal levels are presented in table C-1.

Table C-1. Concentrations of selected metals from Anniston Army Depot (AAD) soils.

	Cd	Cr	Cu	Pb	Zn
	$mg\ kg^{-1}$				
Uncontaminated					
	0.94 ± 0.01	6.0 ± 0.6	1.7 ± 0.14	11.3 ± 0.04	67 ± 2.4
Contaminated					
	3.3 ± 0	7.2 ± 0.7	122 ± 44	21.2 ± 0.2	209 ± 0.1
Contaminated Fortified					
	3.1 ± 0.2	[illegible].4 ± 2.0	145 ± 22	21.4 ± 0.4	203 ± 14

BLANK

APPENDIX D

ANNISTON ARMY DEPOT

MUNITION RESIDUE DATA FROM SOIL AND LEACHATE SAMPLES

The amount of munition residue in each leachate was calculated by multiplication of the sample volume by the concentration. The amount of residue in each soil section was calculated by multiplication of the concentration of munition residue in the soil by the soil weight.

When a value of less than the criteria of detection (trace concentration) appears in tables of concentration, an "*" was entered in the corresponding amount table (concentration x leachate volume or concentration x soil weight). Zero values in the amount tables corresponded to a "none detected" (0) level in the concentration tables.

TABLE D-1. Leachate volumes (mL) from Anniston Army Depot (AAD soil columns.

DAY #	3	7	11	15	18	21	24	28
POS #	MAY 16	MAY 20	MAY 24	MAY 28	MAY 31	JUN 3	JUN 6	JUN 10
	mL							
#5	55	120	85	157	110	130	120	125
#12	60	132	0	187	120	130	118	130
#4	65	100	95	145	90	120	125	100
#7	40	120	110	138	117	129	120	120
#2	31	130	128	140	120	130	125	108
#11	60	115	105	155	105	130	120	120
#6	50	115	113	140	115	125	0	130
#10	65	95	125	157	95	130	115	115
#1	45	117	124	155	30	70	130	110
#9	45	110	125	153	105	137	120	115
#3	115	155	80	177	130	135	115	150
#8	120	130	112	145	117	117	115	90
AVG.	62.58	119.92	100.17	154.08	104.50	123.58	110.25	117.75
STD.	26.47	15.15	33.79	14.29	24.89	17.02	33.53	14.88
%REL. STD. DEV.	42.30	12.63	33.73	9.27	23.82	13.77	30.41	12.64

DAY #	32	35	38	42	46	49		53
POS #	JUN 14	JUN 17	JUN 20	JUN 24	JUN 28	JUL 1	JUL 2	JUL 5
	mL							
#5	118	110	120	120	120	85	85	-
#12	120	110	137	125	120	90	86	-
#4	118	95	118	35	25	0	-	130
#7	112	110	130	135	125	105	-	152
#2	120	112	120	125	125	120	-	140
#11	120	120	130	120	125	95	-	170
#6	50	140	135	125	125	100	-	150
#10	125	120	125	120	130	95	-	165
#1	115	105	125	125	120	0	-	210
#9	125	125	131	125	125	105	-	150
#3	120	130	125	130	125	200	-	154
#8	90	25	142	125	118	115	-	140
AVG.	111.08	108.50	128.17	117.50	115.25	92.50	85.50	156.10
STD.	20.40	27.65	7.06	25.21	27.40	50.31	0.50	21.15
%REL. STD. DEV.	18.36	25.49	5.51	21.45	23.77	54.39	0.58	13.55

TABLE D-1. Continued...

DAY #	56	59	63	66	70	73	77	80
POS #	JUL 8	JUL 11	JUL 15	JUL 18	JUL 22	JUL 25	JUL 29	AUG 1
				mL				
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	50	0	110	0	80	87	55	0
#7	115	135	118	127	130	152	125	145
#2	127	137	130	130	83	125	145	135
#11	97	150	135	126	18	163	122	155
#6	102	145	133	125	125	155	120	140
#10	100	150	110	128	118	160	105	155
#1	96	155	115	135	127	155	120	145
#9	113	137	115	128	130	154	125	145
#3	110	155	125	130	117	154	135	150
#8	115	135	125	115	125	150	130	135
AVG.	102.50	129.90	121.60	114.40	105.30	145.50	118.20	130.50
STD.	19.79	43.96	8.79	38.44	33.95	21.79	23.28	44.01
%REL. STD. DEV.	19.30	33.84	7.23	33.60	32.24	14.97	19.70	33.73

DAY #	84	87	91	94	98	101	105	108
POS #	AUG 5	AUG 8	AUG 12	AUG 15	AUG 19	AUG 22	AUG 26	AUG 29
				mL				
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	105	60	155	-	-	-	-	-
#7	115	130	125	-	-	-	-	-
#2	130	130	130	105	142	140	125	145
#11	115	130	135	125	135	155	120	155
#6	119	130	125	135	145	150	120	150
#10	110	125	130	125	132	160	115	150
#1	110	125	125	125	135	150	110	150
#9	120	130	125	130	140	150	118	150
#3	115	137	135	130	140	140	130	140
#8	115	125	130	125	125	135	125	140
AVG.	115.40	122.20	131.50	125.00	136.75	147.50	120.38	147.50
STD.	6.44	21.01	8.67	8.29	5.95	7.91	5.89	5.00
%REL. STD. DEV.	5.58	17.20	6.60	6.63	4.35	5.36	4.90	3.39

TABLE D-1. Continued...

DAY #	113	116	119	122	126	129	133	137
POS #	SEP 3	SEP 6	SEP 9	SEP 12	SEP 16	SEP 19	SEP 23	SEP 27
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	135	123	130	140	115	150	118	130
#11	130	120	125	153	115	150	120	138
#6	130	115	120	153	108	155	115	125
#10	130	115	120	155	105	155	110	135
#1	130	118	120	152	105	150	115	138
#9	135	120	124	140	112	150	120	140
#3	135	125	125	143	125	145	135	130
#8	137	120	120	140	120	146	120	130
AVG.	132.75	119.50	123.00	147.00	113.13	150.13	119.13	133.25
STD.	2.82	3.28	3.43	6.36	6.66	3.37	6.83	4.92
%REL. STD. DEV.	2.12	2.74	2.79	4.33	5.89	2.25	5.73	3.69

DAY #	140	143	147	150	155	157	161	164
POS #	SEP 30	OCT 3	OCT 7	OCT 10	OCT 15	OCT 17	OCT 21	OCT 24
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	112	155	100	155	120	148	150	100
#10	108	160	85	165	115	145	152	105
#1	120	150	105	157	145	145	148	115
#9	115	150	110	155	135	100	120	165
#3	138	145	118	150	140	135	140	140
#8	120	138	110	150	130	150	135	120
AVG.	118.83	149.67	104.67	155.33	130.83	137.17	140.83	124.17
STD	9.56	6.99	10.35	5.06	10.57	17.28	11.02	22.25
%REL. STD. DEV.	8.05	4.67	9.89	3.25	8.08	12.60	7.83	17.92

TABLE D-1. Continued...

DAY #	168	171	176	179	183	186	189	192
POS #	OCT 28	OCT 31	NOV 5	NOV 8	NOV 12	NOV 15	NOV 18	NOV 21
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	115	135	135	105	155	-	-	-
#10	115	140	125	95	163	-	-	-
#1	120	150	135	120	156	120	130	160
#9	120	147	135	95	180	122	135	152
#3	130	135	140	130	150	135	135	143
#8	128	140	130	125	140	125	130	143
AVG.	121.33	141.17	133.33	111.67	157.33	125.50	132.50	149.50
STD.	5.82	5.64	4.71	14.04	12.30	5.77	2.50	7.09
%REL. STD. DEV.	4.80	4.00	3.54	12.58	7.82	4.59	1.89	4.74

DAY #	196	203	207	210	213	217	221	224
POS #	NOV 25	DEC 2	DEC 6	DEC 9	DEC 12	DEC 16	DEC 20	DEC 23
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#1	120	130	105	125	152	120	148	123
#9	125	150	100	105	180	120	124	145
#3	130	140	130	126	140	130	138	135
#8	125	135	110	120	140	125	125	134
AVG.	125.00	138.75	111.25	119.00	153.00	123.75	133.75	134.25
STD.	3.54	7.40	11.39	8.40	16.34	4.15	9.91	7.79
%REL. STD. DEV.	2.83	5.33	10.24	7.06	10.68	3.35	7.41	5.80

TABLE D-1. Continued...

DAY #	228
POS #	DEC 27
	--mL--
#5	-
#12	-
#4	-
#7	-
#2	-
#11	-
#6	-
#10	-
#1	133
#9	127
#3	115
#8	45
AVG.	105.00
STD.	35.24
%REL. STD. DEV.	33.56

TABLE D-2.1 Concentrations (mg/L) of RDX residues in aqueous leachates collected from MAAP soil columns.

DAY #	3	7	11	15	18	21	24	28
POS #	MAY 16	MAY 20	MAY 24	MAY 28	MAY 31	JUN 3	JUN 6	JUN 10
					mL			
#5	0.00	0.00	0.00	0.39	1.13	1.69	2.39	3.62
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.60	2.36
#4	0.00	0.00	0.00	0.00	<0.07	0.30	1.03	2.45
#7	<0.07	7.66	10.45	13.01	13.26	15.93	16.14	18.46
#2	0.00	3.77	7.24	14.23	18.11	22.35	23.19	27.81
#11	0.00	0.00	1.21	0.81	0.40	1.64	1.80	1.09
#6	0.00	0.30	1.58	2.17	3.24	6.04	0.00	15.17
#10	0.00	0.00	0.51	0.72	0.55	1.41	0.55	0.84
#1	0.00	1.62	3.86	5.51	2.81	1.83	11.10	9.52
#9	0.00	1.93	1.80	4.28	5.76	5.50	5.54	7.26
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	1.53	2.67	4.11	4.53	5.67	6.23	8.86
STD. DEV.	0.00	2.37	3.36	5.07	5.94	7.14	7.58	8.54
%REL. STD. DEV.	0.00	154.84	126.10	123.36	131.14	125.93	121.56	96.43

DAY #	32	35	38	42	46	49	50	53
POS #	JUN 14	JUN 17	JUN 20	JUN 24	JUN 28	JUL 1	JUL 2	JUL 5
					mL			
#5	6.12	7.88	10.62	14.92	15.39	20.18	11.25	-
#12	6.37	10.91	15.20	19.80	22.63	22.50	13.45	-
#4	3.44	5.28	8.16	16.10	15.39	0.00	-	12.19
#7	16.74	17.51	20.12	19.05	19.67	18.87	-	18.69
#2	29.02	26.81	32.79	32.30	34.41	33.94	-	39.29
#11	1.23	1.60	1.88	1.87	2.21	2.58	-	3.63
#6	10.69	11.30	10.16	10.74	12.99	13.88	-	18.65
#10	1.25	3.07	5.31	7.85	9.66	11.99	-	3.63
#1	13.81	11.30	17.19	17.50	21.69	0.00	-	35.86
#9	8.87	8.00	11.19	10.99	10.16	10.76	-	10.42
#3	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
AVG.	9.75	10.37	13.26	15.11	16.42	13.47	12.35	17.79
STD. DEV.	8.05	7.01	8.29	7.77	8.37	10.32	1.10	12.63
%REL. STD. DEV.	82.50	67.61	62.51	51.42	51.00	76.65	8.91	71.00

TABLE D-2.1 Continued...

DAY #	56	59	63	66	70	73	77	80
POS #	JUL 8	JUL 11	JUL 15	JUL 18	JUL 22	JUL 25	JUL 29	AUG 1
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	15.30	0.00	15.05	0.00	17.48	20.95	25.78	0.00
#7	19.45	19.98	16.63	15.19	17.21	16.87	15.32	16.29
#2	36.58	39.50	39.63	38.90	56.05	44.83	45.87	46.17
#11	2.78	2.95	3.12	3.32	3.32	4.97	4.94	4.13
#6	16.17	22.66	20.41	23.30	23.39	27.83	26.98	31.70
#10	2.78	24.10	24.38	27.24	34.11	33.55	35.79	38.58
#1	28.74	31.99	32.36	35.22	37.24	42.99	43.01	43.25
#9	10.76	12.00	11.48	12.60	14.67	16.17	17.24	18.48
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	16.57	19.15	20.38	19.47	25.43	26.02	26.87	24.83
STD. DEV.	11.03	12.73	10.90	13.26	15.38	13.00	13.27	16.54
%REL. STD. DEV.	66.54	66.49	53.45	68.09	60.46	49.95	49.40	66.64

DAY #	84	87	91	94	98	101	105	108
POS #	AUG 5	AUG 8	AUG 12	AUG 15	AUG 19	AUG 22	AUG 26	AUG 29
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	25.53	27.60	29.26	-	-	-	-	-
#7	14.83	18.57	14.98	-	-	-	-	-
#2	47.90	49.36	47.72	54.50	46.76	46.80	44.60	44.86
#11	4.18	6.00	3.70	5.17	4.88	5.35	4.82	6.16
#6	34.93	38.24	34.02	39.86	40.33	41.80	41.52	44.02
#10	39.39	40.69	37.00	35.21	37.48	35.90	36.76	35.33
#1	56.18	49.40	49.01	45.11	46.41	45.23	44.10	43.70
#9	20.37	21.10	20.33	20.33	22.48	22.70	23.67	24.74
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	30.41	31.37	29.50	33.36	33.06	32.96	32.58	33.14
STD. DEV.	16.30	14.62	14.79	16.30	14.97	14.70	14.29	13.97
%REL. STD. DEV.	53.61	46.60	50.13	48.87	45.28	44.59	43.85	42.15

TABLE D-2.1 Continued...

DAY #	113	116	119	122	126	129	133	137
POS #	SEP 3	SEP 6	SEP 9	SEP 12	SEP 16	SEP 19	SEP 23	SEP 27
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	45.21	44.26	41.64	44.14	45.50	50.89	43.10	43.40
#11	6.22	6.95	5.53	6.05	6.56	7.71	7.03	7.62
#6	43.07	43.43	45.33	49.44	47.90	54.47	48.00	47.60
#10	37.24	35.81	34.74	36.48	37.73	30.68	36.20	34.70
#1	42.00	40.57	38.91	38.43	41.70	40.51	40.60	39.40
#9	26.53	23.79	21.76	26.23	27.05	21.73	25.20	24.90
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	33.38	32.47	31.32	33.46	34.41	34.33	33.36	32.94
STD. DEV.	13.59	13.31	13.71	14.18	14.14	16.32	13.72	13.38
%REL. STD. DEV.	40.71	40.99	43.79	42.38	41.08	47.55	41.14	40.64

DAY #	140	143	147	150	155	157	161	164
POS #	SEP 30	OCT 3	OCT 7	OCT 10	OCT 15	OCT 17	OCT 21	OCT 24
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	45.10	46.50	27.63	26.16	25.95	25.74	26.98	44.95
#10	36.20	35.10	21.54	19.52	20.57	20.14	17.91	34.08
#1	37.50	38.30	37.70	22.17	21.12	21.33	21.69	21.26
#9	24.70	24.90	14.80	13.64	13.92	13.71	12.81	26.05
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	35.88	36.20	25.42	20.37	20.39	20.23	19.85	31.59
STD. DEV.	7.29	7.74	8.42	4.55	4.28	4.30	5.19	8.97
%REL. STD. DEV.	20.33	21.37	33.12	22.33	21.00	21.27	26.13	28.41

TABLE D-2.1 Continued...

DAY #	168	171	176	179	183	186	189	192
POS #	OCT 28	OCT 31	NOV 5	NOV 8	NOV 12	NOV 15	NOV 18	NOV 21
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	43.08	26.23	25.70	42.71	39.96	-	-	-
#10	20.15	20.71	21.40	34.48	32.82	-	-	-
#1	36.66	21.96	21.75	32.36	33.69	33.06	32.88	31.60
#9	16.00	16.58	16.44	26.63	26.68	26.89	25.19	23.62
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	28.97	21.37	21.32	34.05	33.29	29.98	29.04	27.61
STD. DEV.	11.23	3.44	3.29	5.77	4.71	3.08	3.84	3.99
%REL. STD. DEV.	38.75	16.10	15.41	16.94	14.14	10.29	13.24	14.45

DAY #	196	203	207	210	213	217	221	224
POS #	NOV 25	DEC 2	DEC 6	DEC 9	DEC 12	DEC 16	DEC 20	DEC 23
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#1	31.42	18.11	18.61	16.37	16.30	16.65	14.55	13.64
#9	23.56	22.66	13.99	9.70	13.08	11.83	12.11	11.80
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	27.49	20.39	16.30	13.04	14.69	14.24	13.33	12.72
STD. DEV.	3.93	2.27	2.31	3.34	1.61	2.41	1.22	0.92
%REL. STD. DEV.	14.30	11.16	14.17	25.58	10.96	16.92	9.15	7.23

TABLE D-2.1 Continued...

DAY #	228
POS #	DEC 27
	--mL--
#5	-
#12	-
#4	-
#7	-
#2	-
#11	-
#6	-
#10	-
#1	12.70
#9	12.80
#3	0.00
#8	0.00
AVG.	12.75
STD. DEV.	0.05
%REL. STD. DEV.	0.39

TABLE D-2.2 Concentrations (mg/L) of 2,4-DNT residues in aqueous leachates collected from AAD soil columns.

DAY #	3	7	11	15	18	21	24	28
POS #	MAY 16	MAY 20	MAY 24	MAY 28	MAY 31	JUN 3	JUN 6	JUN 10
	mL							
#5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#7	0.00	<0.17	0.43	0.42	0.48	0.96	1.15	2.36
#2	0.00	0.00	0.00	0.47	0.74	0.61	0.84	1.42
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#1	0.00	0.00	0.00	<0.17	0.00	0.00	0.59	0.60
#9	0.00	0.00	0.00	<0.17	0.00	0.00	0.09	0.22
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.04	0.09	0.12	0.16	0.27	0.46
STD.	0.00	0.00	0.13	0.18	0.25	0.32	0.41	0.77
%REL. STD. DEV	0.00	0.00	300.00	200.48	205.70	205.99	152.83	166.68

DAY #	32	35	38	42	46	49	50	53
POS #	JUN 14	JUN 17	JUN 20	JUN 24	JUN 28	JUL 1	JUL 2	JUL 5
	mL							
#5	0.00	<0.17	<0.17	<0.17	0.00	<0.17	<0.17	-
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
#4	0.00	0.00	0.00	<0.17	<0.17	0.00	-	0.94
#7	1.74	1.73	2.77	2.69	2.58	1.68	-	2.02
#2	2.38	1.91	3.30	2.89	3.69	3.71	-	5.27
#11	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
#6	0.00	0.00	0.00	<0.17	<0.17	0.17	-	0.46
#10	0.00	0.00	0.00	0.00	0.00	0.00	-	<0.17
#1	1.08	0.99	1.60	1.41	1.81	0.00	-	3.29
#9	0.38	0.30	0.61	0.74	0.99	<0.17	-	0.38
#3	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
AVG.	0.56	0.49	0.83	0.77	0.91	0.56	0.00	1.55
STD.	0.83	0.73	1.21	1.10	1.28	1.16	0.00	1.76
%REL. STD. DEV	148.75	147.34	146.13	142.59	140.77	209.16	0.00	114.01

TABLE D-2.3 Continued...

DAY #	56	59	63	66	70	73	77	80
POS #	JUL 8	JUL 11	JUL 15	JUL 18	JUL 22	JUL 25	JUL 29	AUG 1
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	0.32	0.00	0.75	0.00	1.53	1.97	1.54	0.00
#7	1.86	1.90	1.62	1.58	1.49	1.82	1.45	1.41
#2	4.40	5.61	4.91	5.61	3.54	3.73	6.19	6.11
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	0.31	1.35	1.12	1.73	1.45	1.71	1.31	1.69
#10	0.00	0.19	<0.17	0.44	0.47	0.70	0.48	0.59
#1	2.17	2.95	1.82	2.78	3.02	3.59	2.45	2.48
#9	0.20	0.40	0.56	0.43	0.48	0.41	0.42	0.53
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	1.16	1.55	1.35	1.57	1.50	1.74	1.73	1.60
STD.	1.46	1.82	1.49	1.78	1.16	1.29	1.84	1.89
%REL. STD. DEV	126.12	117.61	110.23	113.22	77.69	74.11	106.14	117.76

DAY #	84	87	91	94	98	101	105	108
POS #	AUG 5	AUG 8	AUG 12	AUG 15	AUG 19	AUG 22	AUG 26	AUG 29
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	1.52	1.51	1.86	-	-	-	-	-
#7	1.20	1.11	1.26	-	-	-	-	-
#2	5.38	5.73	5.24	4.98	5.60	6.40	5.32	5.61
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	1.72	1.89	1.53	2.33	1.61	1.89	1.57	1.76
#10	0.55	0.76	0.91	0.94	1.12	1.56	1.04	1.27
#1	3.23	4.52	3.83	5.03	4.23	5.14	3.94	4.31
#9	0.72	0.32	0.46	0.86	0.51	0.76	0.41	0.76
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	1.79	1.98	1.89	2.36	2.18	2.63	2.05	2.29
STD.	1.63	1.93	1.66	1.99	2.04	2.33	1.93	2.00
%REL. STD. DEV	91.10	97.25	88.10	84.56	93.50	88.82	94.42	87.54

TABLE D-2.2 Continued...

DAY #	113	116	119	122	126	129	133	137
POS #	SEP 3	SEP 6	SEP 9	SEP 12	SEP 16	SEP 19	SEP 23	SEP 27
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	5.22	4.84	4.80	5.36	5.83	3.86	4.21	4.44
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	1.64	1.42	1.18	1.91	1.41	2.14	1.68	2.43
#10	1.10	1.12	1.29	1.33	1.31	3.59	1.62	1.95
#1	3.83	3.62	4.29	4.91	4.58	5.88	3.84	4.51
#9	0.64	0.64	0.60	0.66	<0.17	0.00	0.61	0.90
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	2.07	1.94	2.03	2.36	2.19	2.58	1.99	2.37
STD.	1.85	1.71	1.84	2.05	2.23	2.12	1.55	1.67
%REL. STD. DEV	89.17	88.36	90.57	86.82	102.07	82.36	77.88	70.60

DAY #	1[illegible]	143	147	150	155	157	161	164
POS #	SEP 30	OCT 3	OCT 7	OCT 10	OCT 15	OCT 17	OCT 21	OCT 24
	mL							
#5	-		-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	1.88	2.57	1.27	4.31	2.02	2.73	1.68	1.04
#10	1.69	2.42	1.85	3.69	<0.17	3.24	3.48	1.63
#1	4.12	5.07	3.79	6.43	7.38	7.28	0.00	4.81
#9	0.81	1.14	0.41	0.71	0.69	0.45	0.79	1.28
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	2.13	2.80	1.83	3.78	2.52	3.43	1.49	2.19
STD.	1.22	1.42	1.24	2.05	2.90	2.46	1.29	1.53
%REL. STD. DEV	57.44	50.84	67.88	54.04	114.84	71.86	87.05	69.73

TABLE D-2.2 Continued...

DAY #	166	171	176	179	183	186	189	192
POS #	OCT 28	OCT 31	NOV 5	NOV 8	NOV 12	NOV 15	NOV 18	NOV 21
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	1.93	2.46	1.19	1.31	2.52	-	-	-
#10	1.50	3.20	4.14	2.71	3.90	-	-	-
#1	6.71	5.98	6.28	6.73	7.12	9.62	9.80	7.76
#9	0.53	1.08	0.68	1.07	1.83	1.58	1.43	1.35
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	2.67	3.18	3.07	2.96	3.84	5.60	5.62	4.56
STD.	2.39	1.79	2.27	2.27	2.03	4.02	4.19	3.21
%REL. STD. DEV	89.54	56.18	74.03	76.74	52.93	71.79	74.53	70.36

DAY #	196	203	207	210	213	217	221	224
POS #	NOV 25	DEC 2	DEC 6	DEC 9	DEC 12	DEC 16	DEC 20	DEC 23
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#1	9.41	6.53	6.58	7.08	5.77	5.79	5.69	5.17
#9	1.12	1.08	0.87	0.41	1.37	0.93	1.16	1.17
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	5.27	3.81	3.73	3.75	3.57	3.36	3.43	3.17
STD.	4.15	2.73	2.86	3.34	2.20	2.43	2.26	2.00
%REL. STD. DEV	78.73	71.62	76.64	89.05	61.62	72.32	66.13	63.09

TABLE D-2.2 Continued...

DAY #	228
POS #	DEC 27
	--mL--
#5	-
#12	-
#4	-
#7	-
#2	-
#11	-
#6	-
#10	-
#1	6.28
#9	1.37
#3	0.00
#8	0.00
AVG.	3.83
STD.	2.45
%REL. STD. DEV	64.18

TABLE D-2.3 Concentrations (mg/L) of 2,6-DNT residues in aqueous leachates collected from AAD soil columns.

DAY #	3	7	11	15	18	21	24	28
POS #	MAY 16	MAY 20	MAY 24	MAY 28	MAY 31	JUN 3	JUN 6	JUN 10
					mL			
#5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#7	0.00	0.00	<0.37	0.00	<0.37	0.00	<0.37	0.53
#2	0.00	0.00	0.00	<0.37	<0.37	<0.37	<0.37	0.42
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#1	0.00	0.00	0.00	<0.37	0.00	0.00	<0.37	<0.37
#9	0.00	<0.37	0.00	0.00	0.00	0.00	0.00	0.00
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
STD.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
%REL. STD. DEV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	201.75

DAY #	32	35	38	42	46	49	50	53
POS #	JUN 14	JUN 17	JUN 20	JUN 24	JUN 28	JUL 1	JUL 2	JUL 5
					mL			
#5	0.00	0.00	0.00	<0.37	0.00	0.00	<0.37	-
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
#4	0.00	0.00	0.00	<0.37	<0.37	0.00	-	0.47
#7	0.74	0.73	1.10	1.10	1.09	0.71	-	1.07
#2	1.08	0.94	1.24	1.32	1.57	1.57	-	2.23
#11	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
#6	0.00	0.00	0.00	<0.37	0.00	0.00	-	<0.37
#10	0.00	0.00	0.00	0.00	0.00	0.00	-	<0.37
#1	<0.37	0.54	0.72	0.73	0.81	0.00	-	1.53
#9	<0.37	0.00	<0.37	0.47	<0.37	<0.37	-	<0.37
#3	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
AVG.	0.18	0.22	0.31	0.36	0.35	0.23	0.00	0.66
STD.	0.37	0.35	0.48	0.49	0.56	0.49	0.00	0.80
%REL. STD. DEV	204.32	158.03	157.73	135.21	160.58	217.06	0.00	121.32

TABLE D-2.3 Continued...

DAY #	56	59	63	66	70	73	77	80
POS #	JUL 8	JUL 11	JUL 15	JUL 18	JUL 22	JUL 25	JUL 29	AUG 1
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	0.56	0.00	1.41	0.00	1.75	1.63	1.11	0.00
#7	0.91	0.90	0.00	0.78	0.58	1.07	0.58	0.81
#2	2.03	2.53	2.51	2.87	0.55	1.76	3.12	2.75
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	<0.37	<0.37	0.68	0.90	0.98	1.05	0.92	1.15
#10	0.00	<0.37	<0.37	<0.37	0.39	<0.37	<0.37	<0.37
#1	0.98	1.37	0.80	1.37	1.50	1.72	1.37	1.45
#9	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.56	0.60	0.67	0.74	0.72	0.90	0.89	0.77
STD.	0.68	0.88	0.85	0.95	0.61	0.74	0.98	0.93
%REL. STD. DEV	121.67	146.82	125.55	127.77	84.22	82.30	110.72	120.62

DAY #	84	87	91	94	98	101	105	108
POS #	AUG 5	AUG 8	AUG 12	AUG 15	AUG 19	AUG 22	AUG 26	AUG 29
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	1.34	0.67	0.88	-	-	-	-	-
#7	<0.37	0.72	0.59	-	-	-	-	-
#2	2.48	2.71	2.36	1.82	3.08	3.30	3.00	3.15
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	0.92	1.01	0.82	1.32	1.06	1.11	0.99	1.21
#10	<0.37	<0.37	0.40	0.45	0.66	0.75	0.70	0.96
#1	1.06	1.81	1.71	2.19	2.11	2.59	1.89	2.48
#9	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	0.43
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.73	0.87	0.85	0.96	1.15	1.29	1.10	1.37
STD.	0.84	0.91	0.77	0.86	1.12	1.25	1.07	1.11
%REL. STD. DEV	116.54	105.18	91.06	89.75	97.34	96.81	97.26	80.72

TABLE D-2.3 Continued...

DAY #	113	116	119	122	126	129	133	137
POS #	SEP 3	SEP 6	SEP 9	SEP 12	SEP 16	SEP 19	SEP 23	SEP 27
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	3.06	2.66	3.06	3.06	3.64	1.98	2.37	2.49
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	1.03	0.99	0.93	0.77	0.45	0.92	1.27	1.68
#10	0.76	0.73	0.77	0.64	0.98	1.72	1.32	1.69
#1	2.41	1.95	2.18	2.93	3.22	4.07	2.41	2.84
#9	0.52	0.38	<0.37	0.58	<0.37	0.00	0.56	0.49
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	1.30	1.12	1.16	1.33	1.38	1.45	1.32	1.53
STD.	1.08	0.92	1.12	1.20	1.49	1.40	0.88	1.01
%REL. STD. DEV	83.26	81.88	96.96	90.40	107.87	96.43	66.34	65.87

DAY #	140	143	147	150	155	157	161	164
POS #	SEP 30	OCT 3	OCT 7	OCT 10	OCT 15	OCT 17	OCT 21	OCT 24
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	1.16	1.49	<0.37	1.63	1.19	1.50	0.00	1.15
#10	1.28	1.68	1.57	2.73	1.85	2.56	1.39	1.57
#1	2.70	3.17	2.65	4.35	4.50	4.38	2.56	2.81
#9	0.42	0.55	<0.37	<0.37	<0.37	0.44	0.00	0.72
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	1.39	1.72	1.06	2.18	1.89	2.22	0.99	1.56
STD.	0.82	0.94	1.12	1.59	1.65	1.45	1.07	0.78
%REL. STD. DEV	59.35	54.51	106.35	72.85	87.48	65.54	108.42	49.95

TABLE D-2.3 Continued...

DAY #	168	171	176	179	183	186	189	192
POS #	OCT 28	OCT 31	NOV 5	NOV 8	NOV 12	NOV 15	NOV 18	NOV 21
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	0.83	1.83	1.75	<0.37	1.97	-	-	-
#10	1.13	2.24	3.15	2.36	2.61	-	-	-
#1	5.26	3.49	4.02	1.20	4.90	6.93	7.08	4.70
#9	<0.37	<0.37	0.52	0.50	1.07	0.72	0.96	0.82
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	1.81	1.89	2.36	1.02	2.64	3.82	4.02	2.76
STD.	2.04	1.25	1.34	0.89	1.42	3.11	3.06	1.94
%REL. STD. DEV	112.87	66.18	56.60	87.27	53.69	81.18	76.12	70.29

DAY #	196	203	207	210	213	217	221	224
POS #	NOV 25	DEC 2	DEC 6	DEC 9	DEC 12	DEC 16	DEC 20	DEC 23
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#1	7.51	3.61	3.47	4.65	2.99	3.19	2.83	2.69
#9	0.59	0.60	0.72	0.29	0.94	<0.37	0.87	0.82
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	4.05	2.11	2.10	2.47	1.97	1.60	1.85	1.75
STD.	3.46	1.51	1.37	2.18	1.03	1.60	0.98	0.94
%REL. STD. DEV	85.43	71.50	65.63	88.26	52.16	100.00	52.97	53.45

TABLE D-2.3 Continued...

DAY #	228
POS #	DEC 27
	--mL--
#5	-
#12	-
#4	-
#7	-
#2	-
#11	-
#6	-
#10	-
#1	4.42
#9	1.11
#3	0.00
#8	0.00
AVG.	2.77
STD.	1.65
%REL. STD. DEV	59.86

TABLE D-2.4 Concentrations (mg/L) of TNT residues in aqueous leachates collected from AAD soil columns.

DAY #	3	7	11	15	18	21	24	28
POS #	MAY 16	MAY 20	MAY 24	MAY 28	MAY 31	JUN 3	JUN 6	JUN 10
					mL			
#5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#7	0.00	0.00	<0.09	0.00	<0.09	<0.09	0.09	0.18
#2	0.00	0.00	0.00	<0.09	0.00	0.10	0.81	<0.09
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#1	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00
#9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.01	0.12	0.02
STD.	0.00	0.00	0.00	0.00	0.00	0.03	0.25	0.05
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	300.00	206.41	300.00

DAY #	32	35	38	42	46	49	50	53
POS #	JUN 14	JUN 17	JUN 20	JUN 24	JUN 28	JUL 1	JUL 2	JUL 5
					mL			
#5	0.00	0.00	0.00	0.00	0.00	0.00	0.36	-
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
#4	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
#7	0.29	1.16	1.81	0.62	0.60	0.19	-	0.12
#2	1.89	2.77	3.88	2.74	2.92	2.65	-	5.85
#11	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
#6	0.00	<0.09	0.00	0.00	0.00	0.00	-	<0.09
#10	0.00	0.00	0.00	0.00	0.00	0.00	-	<0.09
#1	1.14	0.72	1.66	0.70	1.99	0.00	-	2.55
#9	0.00	0.00	0.00	<0.09	0.00	0.00	-	<0.09
#3	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
AVG.	0.33	0.46	0.74	0.41	0.55	0.28	0.18	1.07
STD.	0.62	0.86	1.25	0.82	0.99	0.79	0.18	1.99
%REL. STD. DEV.	186.98	184.68	170.39	202.12	179.76	278.41	100.00	186.81

TABLE D-2.4 Continued...

DAY #	56	59	63	66	70	73	77	80
POS #	JUL 8	JUL 11	JUL 15	JUL 18	JUL 22	JUL 25	JUL 29	AUG 1
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#7	0.10	<0.09	<0.09	0.19	0.00	<0.09	<0.09	0.10
#2	2.84	5.11	3.74	2.85	2.80	1.18	4.05	2.52
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	0.00	0.31	0.00	0.76	<0.09	0.14	<0.09	0.12
#10	0.13	0.00	0.00	0.00	0.00	0.16	0.00	<0.09
#1	1.73	1.96	0.59	1.90	1.64	3.04	0.95	0.61
#9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	<0.09
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.60	0.92	0.54	0.71	0.56	0.57	0.63	0.42
STD.	1.01	1.70	1.22	1.02	1.00	1.01	1.33	0.82
%REL. STD. DEV.	168.79	184.77	226.21	142.83	180.81	178.37	213.02	195.18

DAY #	84	87	91	94	98	101	105	108
POS #	AUG 5	AUG 8	AUG 12	AUG 15	AUG 19	AUG 22	AUG 26	AUG 29
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	0.00	0.00	0.00	-	-	-	-	-
#7	0.00	<0.09	<0.09	-	-	-	-	-
#2	2.77	1.91	1.55	0.99	1.04	1.20	0.78	0.52
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	0.14	0.33	<0.09	0.23	0.20	0.15	0.28	0.20
#10	0.00	0.00	<0.09	<0.09	0.00	0.00	0.14	0.11
#1	3.36	3.04	2.49	2.43	2.35	2.66	1.61	1.51
#9	<0.09	0.00	0.00	<0.09	0.00	<0.09	0.15	<0.09
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.78	0.66	0.51	0.61	0.60	0.67	0.49	0.39
STD.	1.33	1.09	0.91	0.89	0.87	0.99	0.56	0.53
%REL. STD. DEV.	169.20	165.08	179.35	145.76	144.68	148.10	112.93	136.08

TABLE D-2.4 Continued...

DAY #	113	116	119	122	126	129	133	137
POS #	SEP 3	SEP 6	SEP 9	SEP 12	SEP 16	SEP 19	SEP 23	SEP 27
	-----	-----	-----	-----	mL	-----	-----	-----
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	0.48	0.31	0.19	0.29	<0.09	0.25	0.18	0.28
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	0.11	<0.09	<0.09	0.14	<0.09	0.23	<0.09	0.38
#10	<0.09	0.00	0.00	<0.09	0.00	0.00	0.00	0.13
#1	1.01	1.65	1.29	1.20	0.88	0.65	0.85	0.87
#9	<0.09	15.27	<0.09	0.00	0.00	0.00	<0.09	0.14
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.27	2.87	0.25	0.27	0.15	0.19	0.17	0.30
STD.	0.37	5.58	0.47	0.43	0.33	0.23	0.31	0.28
%REL. STD. DEV.	139.97	194.12	191.24	157.67	223.61	123.50	180.99	94.37

DAY #	140	143	147	150	155	157	161	164
POS #	SEP 30	OCT 3	OCT 7	OCT 10	OCT 15	OCT 17	OCT 21	OCT 24
	-----	-----	-----	-----	mL	-----	-----	-----
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	0.31	0.16	0.00	0.13	<0.09	<0.09	0.00	0.00
#10	0.00	<0.09	0.00	0.00	0.00	0.00	3.06	0.00
#1	0.92	1.02	0.42	0.33	<0.09	0.25	0.00	0.44
#9	<0.09	0.12	0.00	0.00	0.00	0.00	0.00	0.16
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.31	0.33	0.11	0.12	0.00	0.06	0.77	0.15
STD.	0.38	0.41	0.18	0.14	0.00	0.11	1.33	0.18
%REL. STD. DEV.	121.85	124.76	173.21	117.39	0.00	173.21	173.21	119.81

TABLE D-2.4 Continued...

DAY #	168	171	176	179	183	186	189	192
POS #	OCT 28	OCT 31	NOV 5	NOV 8	NOV 12	NOV 15	NOV 18	NOV 21
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	0.00	0.00	0.00	0.00	0.00	-	-	-
#10	3.04	0.00	0.00	0.00	0.00	-	-	-
#1	0.73	0.68	0.00	0.00	0.86	1.52	0.51	0.32
#9	0.00	0.00	0.00	0.00	0.00	<0.09	0.00	0.00
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.94	0.17	0.00	0.00	0.22	0.76	0.26	0.16
STD.	1.25	0.29	0.00	0.00	0.37	0.76	0.26	0.16
%REL. STD. DEV.	132.32	173.21	0.00	0.00	173.21	100.00	100.00	100.00

DAY #	196	203	207	210	213	217	221	224
POS #	NOV 25	DEC 2	DEC 6	DEC 9	DEC 12	DEC 16	DEC 20	DEC 23
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#1	0.00	0.18	0.11	0.33	0.22	<0.09	<0.09	0.00
#9	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.09	0.06	0.17	0.11	0.00	0.06	0.00
STD.	0.00	0.09	0.06	0.17	0.11	0.00	0.06	0.00
%REL. STD. DEV.	0.00	100.00	100.00	100.00	100.00	0.00	100.00	0.00

TABLE D-2.4 Continued...

DAY #	228
POS #	DEC 27
	--mL--
#5	-
#12	-
#4	-
#7	-
#2	-
#11	-
#6	-
#10	-
#1	0.14
#9	<0.09
#3	0.00
#8	0.00
AVG.	0.07
STD.	0.07
%REL. STD. DEV.	100.00

TABLE D-3.1 Amounts (ug) of RDX residues in aqueous leachates collected from AAD soil columns.

DAY #	3	7	11	15	18	21	24	28
POS #	MAY 16	MAY 20	MAY 24	MAY 28	MAY 31	JUN 3	JUN 6	JUN 10
					ug			
#5	0.00	0.00	0.00	61.23	124.30	219.70	286.80	452.50
#12	0.00	0.00	0.00	0.00	0.00	0.00	70.80	306.80
#4	0.00	0.00	0.00	0.00	*	36.00	128.75	245.00
#7	*	919.20	1149.50	1795.38	1551.42	2054.97	1936.80	2215.20
#2	0.00	490.10	926.72	1992.20	2173.20	2905.50	2898.75	3003.48
#11	0.00	0.00	127.05	125.55	42.00	213.20	216.00	130.80
#6	0.00	34.50	178.54	303.80	372.60	755.00	0.00	1972.10
#10	0.00	0.00	64.00	113.51	52.25	183.30	63.25	96.60
#1	0.00	189.54	478.64	854.05	84.30	128.10	1443.00	1047.20
#9	0.00	212.30	225.00	654.84	604.80	753.50	664.80	834.90
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	184.56	314.95	590.06	500.49	724.93	770.90	1030.46
STD. DEV.	0.00	287.52	389.88	706.65	718.09	932.33	942.86	968.39
%REL. STD. DEV.	0.00	155.78	123.79	119.76	143.48	128.61	122.31	93.98

DAY #	32	35	38	42	46	49	50	53
POS #	JUN 14	JUN 17	JUN 20	JUN 24	JUN 28	JUL 1	JUL 2	JUL 5
					ug			
#5	722.16	866.80	1274.40	1790.40	1846.80	1715.30	956.25	-
#12	764.40	1200.10	2082.40	2475.00	2715.60	2025.00	1156.70	-
#4	405.92	501.60	962.88	563.50	384.75	0.00	-	*
#7	1874.88	1926.10	2615.60	2571.75	2458.75	1981.35	-	2840.88
#2	3482.40	3002.72	3934.80	4037.50	4301.25	4072.80	-	*
#11	147.60	192.00	244.40	224.40	276.25	245.10	-	*
#6	534.50	1582.00	1371.60	1342.50	1623.75	1388.00	-	2797.50
#10	156.25	368.40	663.75	942.00	1255.80	1139.05	-	598.95
#1	1588.15	1186.50	2148.75	2187.50	2602.80	0.00	-	7530.60
#9	1108.75	1000.00	1465.89	1373.75	1270.00	1129.80	-	1563.00
#3	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
AVG.	1078.50	1182.62	1676.45	1750.83	1873.58	1369.64	1056.48	1916.37
STD. DEV.	967.71	791.61	1012.64	1064.06	1142.54	1155.75	100.22	2398.66
%REL. STD. DEV.	89.73	66.94	60.40	60.77	60.98	84.38	9.49	125.17

TABLE D-3.1 Continued...

DAY #	56	59	63	66	70	73	77	80
POS #	JUL 8	JUL 11	JUL 15	JUL 18	JUL 22	JUL 25	JUL 29	AUG 1
	ug							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	*	*	*	*	*	*	*	*
#7	2236.75	2697.30	1962.34	1929.13	2237.30	*	*	2362.05
#2	*	*	*	*	*	*	*	*
#11	*	*	*	*	*	*	*	*
#6	1649.34	3285.70	2714.53	2912.50	2923.75	4313.65	3237.60	4438.00
#10	278.00	3615.00	2681.80	3486.72	4024.98	5368.00	3757.95	5979.90
#1	2759.04	4958.45	3721.40	4754.70	4729.48	6663.45	5161.20	6271.25
#9	1215.88	1644.00	1320.20	1612.80	1907.10	2490.18	2155.00	2679.60
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	1017.38	2025.06	1550.03	1836.98	1977.83	2354.41	1788.97	2716.35
STD. DEV.	1037.48	1789.61	1359.34	1679.80	1748.75	2590.36	1945.60	2462.59
%REL. STD. DEV.	101.98	88.37	87.70	91.44	88.42	110.02	108.76	90.66

DAY #	84	87	91	94	98	101	105	108
POS #	AUG 5	AUG 8	AUG 12	AUG 15	AUG 19	AUG 22	AUG 26	AUG 29
	ug							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	*	*	*	-	-	-	-	-
#7	1705.45	2414.10	1872.50	-	-	-	-	-
#2	*	*	*	*	*	*	*	*
#11	*	*	*	*	*	*	*	*
#6	4156.67	4971.20	4252.50	*	*	*	*	*
#10	4332.90	5086.25	4810.00	*	*	*	*	*
#1	6179.80	6175.00	6126.25	5638.75	6265.35	6784.50	4851.00	6555.00
#9	2444.40	2743.00	2541.25	2642.90	3147.20	3405.00	2793.06	3711.00
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	2352.40	2673.69	2450.31	1380.27	1568.76	1698.25	1274.01	1711.00
STD. DEV.	2203.84	2368.44	2255.07	2135.00	2394.21	2592.27	1897.14	2555.20
%REL. STD. DEV.	93.68	88.58	92.03	154.68	152.62	152.64	148.91	149.34

TABLE D-3.1 Continued...

DAY #	113	116	119	122	126	129	133	137
POS #	SEP 3	SEP 6	SEP 9	SEP 12	SEP 16	SEP 19	SEP 23	SEP 27
	ug							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	*	*	*	*	*	*	*	*
#11	*	*	*	*	*	*	*	*
#6	*	*	*	*	*	*	*	*
#10	*	*	*	*	*	*	*	*
#1	5460.00	4787.26	4669.20	5841.36	4378.50	6076.50	4669.00	5437.20
#9	3581.55	2854.80	2698.24	3672.20	3029.60	3259.50	3024.00	3486.00
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	1506.93	1273.68	1227.91	1585.59	1234.68	1556.00	1282.17	1487.20
STD. DEV.	2199.02	1885.66	1827.36	2328.16	1789.00	2345.97	1874.41	2177.34
%REL. STD. DEV.	145.93	148.05	148.82	146.83	144.90	150.77	146.19	146.41

DAY #	140	143	147	150	155	157	161	164
POS #	SEP 30	OCT 3	OCT 7	OCT 10	OCT 15	OCT 17	OCT 21	OCT 24
	ug							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	*	*	*	*	*	*	4047.00	*
#10	*	*	*	*	*	*	*	*
#1	*	*	*	*	*	*	3210.12	*
#9	*	*	*	*	*	*	*	*
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	1814.28	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	1838.25	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	101.32	0.00

TABLE D-3.1 Continued...

DAY #	168	171	176	179	183	186	189	192
POS #	OCT 28	OCT 31	NOV 5	NOV 8	NOV 12	NOV 15	NOV 18	NOV 21
	ug							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	*	*	*	*	*	-	-	-
#10	*	*	*	*	*	-	-	-
#1	*	*	*	3883.20	*	*	*	*
#9	*	*	*	*	*	*	*	*
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	970.80	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	1681.47	0.00	0.00	0.00	0.00
%REL. STD DEV.	0.00	0.00	0.00	173.21	0.00	0.00	0.00	0.00

DAY #	196	203	207	210	213	217	221	224
POS #	NOV 25	DEC 2	DEC 6	DEC 9	DEC 12	DEC 16	DEC 20	DEC 23
	ug							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#1	*	*	*	*	*	*	*	*
#9	*	*	*	1018.50	*	*	*	*
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	509.25	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	509.25	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00

TABLE D-3.1 Continued...

DAY #	228
POS #	DEC 27
	--ug--
#5	-
#12	-
#4	-
#7	-
#2	-
#11	-
#6	-
#10	-
#1	*
#9	*
#3	0.00
#8	0.00
AVG.	0.00
STD. DEV.	0.00
%REL. STD. DEV.	0.00

TABLE D-3.2 Amounts (ug) of 2,4-DNT residues in aqueous leachates collected from AAD soil columns.

DAY #	3	7	11	15	18	21	24	28
POS #	MAY 16	MAY 20	MAY 24	MAY 28	MAY 31	JUN 3	JUN 6	JUN 10
					mL			
#5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#7	0.00	*	47.30	57.27	55.93	123.20	138.00	283.20
#2	0.00	0.00	0.00	65.80	88.80	79.30	105.00	153.36
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#1	0.00	0.00	0.00	*	0.00	0.00	76.70	66.00
#9	0.00	0.00	0.00	*	0.00	0.00	11.28	25.30
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	4.73	12.31	14.47	20.25	33.10	52.79
STD.	0.00	0.00	14.19	24.69	29.86	41.67	50.12	89.92
%REL. STD. DEV	0.00	0.00	3.00	2.01	2.06	2.06	1.51	1.70

DAY #	32	35	38	42	46	49	50	53
POS #	JUN 14	JUN 17	JUN 20	JUN 24	JUN 28	JUL 1	JUL 2	JUL 5
					mL			
#5	0.00	*	*	*	0.00	*	*	-
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
#4	0.00	0.00	0.00	*	*	0.00	-	122.20
#7	194.88	190.30	360.10	363.15	322.50	176.40	-	307.04
#2	285.60	213.92	396.00	361.25	461.25	445.20	-	737.80
#11	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
#6	0.00	0.00	0.00	*	*	17.00	-	69.00
#10	0.00	0.00	0.00	0.00	0.00	0.00	-	*
#1	124.20	104.37	200.00	176.25	217.20	0.00	-	690.90
#9	47.50	37.50	79.91	92.50	123.75	0.00	-	57.00
#3	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
AVG.	65.22	54.61	103.60	99.32	112.47	63.86	0.00	247.99
STD.	97.31	80.28	150.18	142.61	158.98	137.41	0.00	284.36
%REL. STD. DEV	1.49	1.47	1.45	1.44	1.41	2.15	0.00	1.15

TABLE D-3.2 Continued...

DAY #	56	59	63	66	70	73	77	80
POS #	JUL 8	JUL 11	JUL 15	JUL 18	JUL 22	JUL 25	JUL 29	AUG 1
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	16.00	0.00	82.50	0.00	122.40	171.39	84.70	0.00
#7	213.90	256.50	191.16	200.66	193.70	276.64	181.25	204.45
#2	558.80	768.57	638.30	729.30	293.82	466.25	897.55	824.85
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	31.62	195.75	148.96	216.25	181.25	265.05	157.20	236.60
#10	0.00	28.50	*	56.32	55.46	112.00	50.40	91.45
#1	208.32	457.25	209.30	375.30	383.54	556.45	294.00	359.60
#9	22.60	54.80	64.40	55.04	62.40	63.14	52.50	76.85
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	131.41	220.17	166.83	204.11	161.57	238.86	214.70	224.23
STD.	182.02	254.93	193.09	232.56	120.89	181.40	272.33	254.83
%REL. STD. DEV	1.39	1.16	1.16	1.14	0.75	0.76	1.27	1.14

DAY #	84	87	91	94	98	101	105	108
POS #	AUG 5	AUG 8	AUG 12	AUG 15	AUG 19	AUG 22	AUG 26	AUG 29
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	159.60	90.60	288.30	-	-	-	-	-
#7	138.00	144.30	157.50	-	-	-	-	-
#2	699.40	744.90	681.20	522.90	795.20	896.00	665.00	813.45
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	204.68	245.70	191.25	314.55	233.45	283.50	188.40	264.00
#10	60.50	95.00	118.30	117.50	147.84	249.60	119.60	190.50
#1	355.30	565.00	478.75	628.75	571.05	771.00	433.40	646.50
#9	86.40	41.60	57.50	111.80	71.40	114.00	48.38	114.00
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	212.98	240.89	246.60	282.58	303.16	385.68	242.46	338.08
STD.	209.17	252.50	214.63	229.08	285.33	331.77	234.33	292.37
%REL. STD. DEV	0.98	1.05	0.87	0.81	0.94	0.86	0.97	0.86

TABLE D-3.2 Continued...

DAY #	113	116	119	122	126	129	133	137
POS #	SEP 3	SEP 6	SEP 9	SEP 12	SEP 16	SEP 19	SEP 23	SEP 27
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	704.70	595.32	624.00	750.40	670.45	579.00	496.78	577.20
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	213.20	163.30	141.60	292.23	152.28	331.70	193.20	303.75
#10	143.00	128.80	154.80	206.15	137.55	556.45	178.20	263.25
#1	497.90	427.16	514.80	746.32	480.90	882.00	441.60	622.38
#9	86.40	76.80	74.40	92.40	*	0.00	72.96	126.00
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	274.20	231.90	251.60	347.92	240.20	391.53	230.46	315.43
STD.	247.24	209.51	232.43	297.28	250.57	319.65	181.45	223.97
%REL. STD. DEV	0.90	0.90	0.92	0.85	1.04	0.82	0.79	0.71

DAY #	140	143	147	150	155	157	161	164
POS #	SEP 30	OCT 3	OCT 7	OCT 10	OCT 15	OCT 17	OCT 21	OCT 24
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	210.56	398.35	127.00	668.05	242.40	404.04	252.00	104.00
#10	182.52	387.20	157.25	608.85	*	469.80	528.96	171.15
#1	494.40	760.50	397.95	1009.51	1070.10	1055.60	0.00	553.15
#9	93.15	171.00	45.10	110.05	93.15	45.00	94.80	211.20
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	245.16	429.26	181.83	599.12	351.41	493.61	218.94	259.88
STD.	150.29	211.63	131.35	321.11	423.85	362.52	200.34	173.60
%REL. STD. DEV	0.61	0.49	0.72	0.54	1.21	0.73	0.92	0.67

TABLE D-3.2 Continued...

DAY #	168	171	176	179	183	186	189	192
POS #	OCT 28	OCT 31	NOV 5	NOV 8	NOV 12	NOV 15	NOV 18	NOV 21
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	221.95	332.10	160.65	137.55	390.60	-	-	-
#10	172.50	448.00	517.50	257.45	635.70	-	-	-
#1	805.20	897.00	847.80	807.60	1110.72	1154.40	1274.00	1241.60
#9	63.60	158.76	91.80	101.65	329.40	192.76	193.05	205.20
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	315.81	458.97	404.44	326.06	616.61	673.58	733.53	723.40
STD.	288.30	273.04	302.71	283.94	307.44	480.82	540.48	518.20
%REL. STD. DEV	0.91	0.59	0.75	0.87	0.50	0.71	0.74	0.72

DAY #	196	203	207	210	213	217	221	224
POS #	NOV 25	DEC 2	DEC 6	DEC 9	DEC 12	DEC 16	DEC 20	DEC 23
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#1	1129.20	848.90	690.90	885.00	877.04	694.80	842.12	635.91
#9	140.00	162.00	87.00	43.05	246.60	111.60	143.84	169.65
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	634.60	505.45	388.95	464.03	561.82	403.20	492.98	402.78
STD.	494.60	343.45	301.95	420.98	315.22	291.60	349.14	233.13
%REL. STD. DEV	0.78	0.68	0.78	0.91	0.56	0.72	0.71	0.58

TABLE D-3.2 Continued...

DAY #	228
POS #	DEC 27
	--mL--
#5	-
#12	-
#4	-
#7	-
#2	-
#11	-
#6	-
#10	-
#1	835.24
#9	173.99
#3	0.00
#8	0.00
AVG.	504.62
STD.	330.62
%REL. STD. DEV	0.66

TABLE D-3.3 Amounts (ug) of 2,6-DNT residues in aqueous leachates collected from AAD soil columns.

DAY #	3	7	11	15	18	21	24	28
POS #	MAY 16	MAY 20	MAY 24	MAY 28	MAY 31	JUN 3	JUN 6	JUN 10
					mL			
#5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#7	0.00	0.00	*	0.00	*	0.00	*	63.96
#2	0.00	0.00	0.00	*	*	*	*	45.36
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#1	0.00	0.00	0.00	*	0.00	0.00	*	*
#9	0.00	*	0.00	0.00	0.00	0.00	0.00	0.00
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.93
STD.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.26
%REL. STD. DEV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.04

DAY #	32	35	38	42	46	49	50	53
POS #	JUN 14	JUN 17	JUN 20	JUN 24	JUN 28	JUL 1	JUL 2	JUL 5
					mL			
#5	0.00	0.00	0.00	*	0.00	0.00	*	-
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
#4	0.00	0.00	0.00	*	*	0.00	-	61.10
#7	82.88	80.30	143.00	148.50	136.25	74.55	-	162.64
#2	129.60	105.28	148.80	165.00	196.25	188.40	-	312.20
#11	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
#6	0.00	0.00	0.00	*	0.00	0.00	-	*
#10	0.00	0.00	0.00	0.00	0.00	0.00	-	*
#1	*	56.70	90.00	91.25	97.20	0.00	-	321.30
#9	*	0.00	*	58.75	*	*	-	*
#3	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
AVG.	21.25	24.23	38.18	46.35	42.97	26.30	0.00	107.16
STD.	43.76	38.57	60.09	62.91	69.33	58.43	0.00	131.83
%REL. STD. DEV	2.06	1.59	1.57	1.36	1.61	2.22	0.00	1.23

TABLE D-3.3 Continued...

DAY #	56	59	63	66	70	73	77	80
POS #	JUL 8	JUL 11	JUL 15	JUL 18	JUL 22	JUL 25	JUL 29	AUG 1
					mL			
#5	.	.	.	.	.	.	.	.
#12	.	.	.	.	.	.	.	.
#4	28.00	0.00	155.10	0.00	140.00	141.81	61.05	0.00
#7	104.65	121.50	0.00	99.06	75.40	162.64	72.50	117.45
#2	257.81	346.61	326.30	373.10	45.65	220.00	457.40	371.75
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	*	*	90.44	112.50	122.50	167.75	110.40	161.00
#10	0.00	*	*	*	46.02	*	*	*
#1	94.08	212.35	92.00	184.95	190.50	266.60	164.40	210.25
#9	*	*	*	*	*	*	*	*
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	60.57	85.06	82.98	96.20	77.51	119.23	107.59	107.49
STD.	84.93	123.55	107.29	123.41	63.96	97.75	141.53	127.14
%REL. STD. DEV	1.40	1.45	1.29	1.28	0.83	0.83	1.32	1.18

DAY #	84	87	91	94	98	101	105	108
POS #	AUG 5	AUG 8	AUG 12	AUG 15	AUG 19	AUG 22	AUG 26	AUG 29
					mL			
#5	.	.	.	.	.	.	.	.
#12	.	.	.	.	.	.	.	.
#4	140.70	40.20	136.40	.	.	.	.	.
#7	*	93.60	73.75	.	.	.	.	.
#2	322.40	352.30	306.80	191.10	437.36	467.00	375.00	456.75
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	109.48	131.30	102.50	178.20	153.70	166.50	118.80	181.50
#10	*	*	52.00	56.25	87.17	170.00	80.50	144.00
#1	116.60	226.25	213.75	273.75	284.85	188.50	207.90	172.00
#9	*	*	*	*	*	*	*	64.50
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	86.15	105.46	110.65	116.55	160.51	189.50	130.37	203.33
STD.	106.04	119.35	99.45	103.98	157.62	178.64	130.68	161.91
%REL. STD. DEV	1.23	1.13	0.90	0.89	0.98	0.94	1.00	0.80

TABLE D-3.3 Continued...

DAY #	113	116	119	122	126	129	133	137
POS #	SEP 3	SEP 6	SEP 9	SEP 12	SEP 16	SEP 19	SEP 23	SEP 27
				mL				
#5	.	.	.	.	.	.	.	.
#12	.	.	.	.	.	.	.	.
#4	.	.	.	.	.	.	.	.
#7	.	.	.	.	.	.	.	.
#2	413.10	327.18	397.80	428.40	418.60	297.00	279.66	323.70
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	133.90	113.85	111.60	117.81	48.60	142.60	146.05	210.00
#10	98.80	83.95	92.40	99.20	102.90	266.60	145.20	228.15
#1	313.30	230.10	261.60	445.36	338.10	610.50	277.15	391.92
#9	70.20	45.60	*	81.20	*	0.00	67.20	68.60
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	171.55	133.45	143.90	195.33	151.37	219.45	152.54	203.73
STD	144.25	111.98	143.43	174.77	165.84	209.52	101.93	135.53
COEFF. STD. DEV	0.84	0.84	1.00	0.89	1.10	0.95	0.67	0.67

DAY #	140	143	147	150	155	157	161	164
POS #	SEP 30	OCT 3	OCT 7	OCT 10	OCT 15	OCT 17	OCT 21	OCT 24
				mL				
#5	.	.	.	.	.	.	.	.
#12	.	.	.	.	.	.	.	.
#4	.	.	.	.	.	.	.	.
#7	.	.	.	.	.	.	.	.
#2	.	.	.	.	.	.	.	.
#11	.	.	.	.	.	.	.	.
#6	129.97	230.95	*	252.65	142.80	222.00	0.00	115.00
#10	138.24	268.80	133.45	450.45	212.75	371.20	211.28	164.85
#1	324.00	475.50	278.25	682.95	652.50	635.10	378.88	323.15
#9	48.30	82.50	*	*	*	44.00	0.00	118.80
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	160.12	264.44	102.93	346.51	252.01	318.08	147.54	180.45
STD	100.91	140.35	114.95	251.43	243.60	216.61	158.99	84.69
COEFF. STD. DEV	0.63	0.53	1.12	0.73	0.97	0.68	1.08	0.47

TABLE D-3.3 Continued...

DAY #	168	171	176	179	183	186	189	192
POS #	OCT 28	OCT 31	NOV 5	NOV 8	NOV 12	NOV 15	NOV 18	NOV 21
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	95.45	247.05	236.25	*	305.35	-	-	-
#10	129.95	313.60	393.75	224.20	425.43	-	-	-
#1	631.20	523.50	542.70	144.00	764.40	831.60	920.40	752.00
#9	*	*	70.20	47.50	192.60	87.84	129.60	124.64
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	214.15	271.04	310.72	103.93	421.95	459.72	525.00	438.32
STD.	245.44	186.81	176.14	86.68	214.17	371.88	395.40	313.68
%REL. STD. DEV	1.15	0.69	0.57	0.83	0.51	0.81	0.75	0.72

DAY #	196	203	207	210	213	217	221	224
POS #	NOV 25	DEC 2	DEC 6	DEC 9	DEC 12	DEC 16	DEC 20	DEC 23
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#1	901.20	469.30	364.35	581.25	454.48	382.80	418.84	330.87
#9	73.75	90.00	72.00	30.45	169.20	*	107.88	118.32
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	487.47	279.65	218.18	305.85	311.84	191.40	263.36	224.60
STD.	413.72	189.65	146.18	275.40	142.64	191.40	155.48	106.27
%REL. STD. DEV	0.85	0.68	0.67	0.90	0.46	1.00	0.59	0.47

TABLE D-3.3 Continued...

DAY #	228
POS #	DEC 27
	--mL--
#5	-
#12	-
#4	-
#7	-
#2	-
#11	-
#6	-
#10	-
#1	587.86
#9	140.97
#3	0.00
#8	0.00
AVG.	364.42
STD.	223.45
%REL. STD. DEV	0.61

TABLE D-3.4 Amounts (ug) of TNT residues in aqueous leachates collected from AAD soil columns.

DAY #	3	7	11	15	18	21	24	28
POS #	MAY 16	MAY 20	MAY 24	MAY 28	MAY 31	JUN 3	JUN 6	JUN 10
	mL							
#5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#7	0.00	0.00	*	0.00	*	*	11.28	21.36
#2	0.00	0.00	0.00	*	0.00	13.26	100.88	*
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#1	0.00	0.00	0.00	0.00	0.00	0.00	37.31	0.00
#9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	1.33	14.95	2.14
STD.	0.00	0.00	0.00	0.00	0.00	3.98	30.76	6.41
%REL. STD. DEV	0.00	0.00	0.00	0.00	0.00	3.00	2.06	3.00

DAY #	32	35	38	42	46	49	50	53
POS #	JUN 14	JUN 17	JUN 20	JUN 24	JUN 28	JUL 1	JUL 2	JUL 5
	mL							
#5	0.00	0.00	0.00	0.00	0.00	0.00	30.60	-
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
#4	0.00	0.00	0.00	0.00	0.00	0.00	-	*
#7	32.48	127.60	235.30	83.70	75.00	19.95	-	18.24
#2	226.80	310.24	465.60	342.50	365.00	318.00	-	*
#11	0.00	0.00	0.00	0.00	0.00	0.00	-	*
#6	0.00	*	0.00	0.00	0.00	0.00	-	*
#10	0.00	0.00	0.00	0.00	0.00	0.00	-	*
#1	131.10	75.60	207.50	87.50	238.80	0.00	-	535.50
#9	0.00	0.00	0.00	*	0.00	0.00	-	*
#3	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00
AVG.	39.04	51.34	90.84	51.37	67.88	33.80	15.30	69.22
STD.	73.78	95.86	152.54	102.75	122.39	94.92	15.30	176.34
%REL. STD. DEV	1.89	1.87	1.68	2.00	1.80	2.81	1.00	2.55

TABLE D-3.4 Continued...

DAY #	56	59	63	66	70	73	77	80
POS #	JUL 8	JUL 11	JUL 15	JUL 18	JUL 22	JUL 25	JUL 29	AUG 1
	---------	---------	---------	---- mL ----	---------	---------	---------	---------
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	*	*	*	*	*	*	*	*
#7	11.50	*	*	24.13	0.26	*	*	14.50
#2	*	*	*	*	*	*	*	*
#11	*	*	*	*	*	*	*	*
#6	0.00	44.95	0.00	95.00	*	21.70	*	16.80
#10	13.00	0.00	0.00	0.00	0.00	25.60	0.00	*
#1	166.08	303.80	67.85	256.50	208.28	471.20	114.00	88.45
#9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	23.82	43.59	8.48	46.95	26.07	64.81	14.25	14.97
STD.	54.02	99.44	22.44	84.97	68.87	153.93	37.70	28.56
%REL. STD. DEV	2.27	2.28	2.65	1.81	2.64	2.37	2.65	1.91

DAY #	84	87	91	94	98	101	105	108
POS #	AUG 5	AUG 8	AUG 12	AUG 15	AUG 19	AUG 22	AUG 26	AUG 29
	---------	---------	---------	---- mL ----	---------	---------	---------	---------
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	*	*	*	-	-	-	-	-
#7	0.00	*	*	-	-	-	-	-
#2	*	*	*	*	*	*	*	*
#11	*	*	*	*	*	*	*	*
#6	16.66	43.42	*	*	*	*	*	*
#10	0.00	0.00	*	*	*	*	*	*
#1	369.60	380.00	311.25	303.75	317.25	399.00	177.10	226.50
#9	*	0.00	0.00	*	0.00	*	17.70	*
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	48.28	52.93	38.91	50.63	52.88	66.50	32.47	37.75
STD.	121.57	124.44	102.94	113.20	118.23	148.70	65.00	84.41
%REL. STD. DEV	2.52	2.35	2.65	2.24	2.24	2.24	2.00	2.24

TABLE D-3.4 Continued...

DAY #	113	116	119	122	126	129	133	137
POS #	SEP 3	SEP 6	SEP 9	SEP 12	SEP 16	SEP 19	SEP 23	SEP 27
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	*	*	*	*	*	*	*	*
#11	*	*	*	*	*	*	*	*
#6	*	*	*	*	*	*	*	*
#10	*	*	*	*	*	*	*	*
#1	131.30	194.70	154.80	182.40	92.40	97.50	97.75	120.06
#9	*	1832.40	*	0.00	0.00	0.00	*	19.46
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	21.88	337.85	25.80	30.40	15.40	16.25	16.29	23.25
STD.	48.93	672.15	57.69	67.98	34.44	36.34	36.43	43.87
%REL. STD. DEV	2.24	1.99	2.24	2.24	2.24	2.24	2.24	1.89

DAY #	140	143	147	150	155	157	161	164
POS #	SEP 30	OCT 3	OCT 7	OCT 10	OCT 15	OCT 17	OCT 21	OCT 24
	mL							
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	*	*	*	*	*	*	*	*
#10	*	*	*	*	*	*	*	*
#1	*	*	*	*	*	*	*	*
#9	*	*	*	*	*	*	*	*
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE D-3.4 Continued...

DAY #	168	171	176	179	183	186	189	192
POS #	OCT 28	OCT 31	NOV 5	NOV 8	NOV 12	NOV 15	NOV 18	NOV 21
	--------------	--------------	--------------	-------	mL -------	--------------	--------------	--------------
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	*	*	*	*	*	-	-	-
#10	*	*	*	*	*	-	-	-
#1	*	*	*	*	*	*	*	*
#9	*	*	*	*	*	*	*	*
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DAY #	196	203	207	210	213	217	221	224
POS #	NOV 25	DEC 2	DEC 6	DEC 9	DEC 12	DEC 16	DEC 20	DEC 23
	--------------	--------------	--------------	-------	mL -------	--------------	--------------	--------------
#5	-	-	-	-	-	-	-	-
#12	-	-	-	-	-	-	-	-
#4	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#2	-	-	-	-	-	-	-	-
#11	-	-	-	-	-	-	-	-
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#1	*	*	*	*	*	*	*	*
#9	*	*	*	*	*	*	*	*
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE D-3.4 Continued...

DAY #	228
POS #	DEC 27
	--mL--
#5	-
#12	-
#4	-
#7	-
#2	-
#11	-
#6	-
#10	-
#1	*
#9	*
#3	0.00
#8	0.00
AVG.	0.00
STD.	0.00
%REL. STD. DEV	0.00

TABLE D-4.1. Concentrations (mg/kg) of munition residues in soil sections (triplicates) from AAD soil columns, after 0 weeks of leaching (time zero).

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
	COLUMN #s 1,2,4,5,6,7,9,10,11,12 (Treatment columns)							
		mg/kg						
1	AVG.	95.60	1222.08	435.84	1024.41	225.02	0.00	0.00
	STD. DEV.	10.99	141.68	50.99	119.76	29.57	0.00	0.00
	%REL. STD. DEV.	11.50	11.59	11.70	11.69	13.14	0.00	0.00
	Below this depth: no detectable concentrations of munition residues.							
	COLUMN #s 3 and 8 (Control columns)							
1	AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	At all depths: no detectable concentrations of munition residues.							

TABLE D-4.2. Concentrations (mg/kg) of munition residues in soil sections (triplicate from AAD soil columns, after 6.5 weeks of leaching.

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #5					mg/kg			
1	AVG.	82.77	1076.33	331.36	107.64	16.81	0.00	0.00
	STD. DEV.	4.11	1.25	13.39	6.09	2.48	0.00	0.00
	%REL. STD. DEV.	4.96	0.12	4.04	5.66	14.77	0.00	0.00
2	AVG.	6.10	56.13	90.87	142.63	35.46	<15.4	0.00
	STD. DEV.	0.36	3.93	4.78	3.27	0.80	-	0.00
	%REL. STD. DEV.	5.83	6.99	5.26	2.29	2.24	-	0.00
3	AVG.	<2.9	22.43	10.04	75.20	24.74	<15.4	0.00
	STD. DEV.	-	0.05	2.45	1.58	0.46	-	0.00
	%REL. STD. DEV.	-	0.21	24.37	2.10	1.87	-	0.00
4	AVG.	<2.9	18.37	10.94	32.68	9.02	<15.4	0.00
	STD. DEV.	-	0.26	0.32	0.51	0.05	-	0.00
	%REL. STD. DEV.	-	1.43	2.91	1.55	0.51	-	0.00
5	AVG.	<2.9	14.20	8.32	18.85	6.44	0.00	0.00
	STD. DEV.	-	0.08	1.13	0.39	0.07	0.00	0.00
	%REL. STD. DEV.	-	0.57	13.58	2.06	1.04	0.00	0.00
6	AVG.	<2.9	9.17	<6.1	11.34	<5.2	0.00	0.00
	STD DEV.	-	1.39	-	4.50	-	0.00	0.00
	%REL STD. DEV.	-	15.18	-	39.67	-	0.00	0.00
* 7	AVG.	<2.9	<5.8	<6.1	9.93	<5.2	0.00	0.00
	STD. DEV.	-	-	-	0.31	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	3.12	-	0.00	0.00
* 8-9	AVG.	<2.9	<5.8	<6.1	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	-	-	0.00	0.00
* 10-12	AVG.	<2.9	<5.8	0.00	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00

TABLE D-4.2. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #5 CONT'D		------------------------			mg/kg	------------------------		
* 13-15	AVG.	0.00	<5.8	<6.1	6.55	<5.2	0.00	0.00
	STD. DEV.	0.00	-	-	0.07	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	-	1.09	-	0.00	0.00
COLUMN #12								
1	AVG.	57.43	1076.33	295.85	139.22	25.74	0.00	0.00
	STD. DEV.	3.09	7.32	14.40	7.35	1.17	0.00	0.00
	%REL. STD. DEV.	5.37	0.68	4.87	5.28	4.55	0.00	0.00
2	AVG.	15.23	237.80	238.50	325.51	76.27	<15.4	0.00
	STD. DEV.	0.68	2.55	2.53	1.34	5.07	-	0.00
	%REL. STD. DEV.	4.46	1.07	1.06	0.41	6.64	-	0.00
3	AVG.	3.93	37.30	47.49	131.08	33.46	<15.4	0.00
	STD. DEV.	0.05	0.22	1.33	2.85	0.66	-	0.00
	%REL. STD. DEV.	1.20	0.58	2.79	2.17	1.96	-	0.00
4	AVG.	<2.9	20.20	13.67	57.44	16.83	<15.4	0.00
	STD. DEV.	-	0.22	0.18	1.90	0.65	-	0.00
	%REL. STD. DEV.	-	1.07	1.33	3.30	3.89	-	0.00
5	AVG.	<2.9	15.53	<6.1	20.61	9.04	<15.4	0.00
	STD. DEV.	-	0.12	-	0.82	0.90	-	0.00
	%REL. STD. DEV.	-	0.80	-	3.98	9.91	-	0.00
6	AVG.	<2.9	11.17	<6.1	9.01	<5.2	<15.4	0.00
	STD. DEV.	-	0.46	-	0.67	-	-	0.00
	%REL. STD. DEV.	-	4.16	-	7.42	-	-	0.00
* 7	AVG.	<2.9	<5.8	<6.1	9.93	<5.2	0.00	0.00
	STD. DEV.	-	-	-	0.31	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	3.12	-	0.00	0.00

TABLE D-4.2. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #12 CONT'D					mg/kg			
* 8-9	AVG.	<2.9	<5.8	<6.1	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	-	-	0.00	0.00
* 10-12	AVG.	<2.9	<5.8	0.00	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00
* 13-15	AVG.	0.00	<5.8	<6.1	6.55	<5.2	0.00	0.00
	STD. DEV.	0.00	-	-	0.07	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	-	1.09	-	0.00	0.00

* (COLUMNS #s 5 & 12 COMBINED FROM SECTION 7 DOWN)

TABLE D-4.3. Concentrations (mg/kg) of munition residues in soil sections (triplicate from AAD soil columns, after 13 weeks of leaching.

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #4					mg/kg			
1	AVG.	60.00	726.20	200.56	107.25	9.83	<15.4	0.00
	STD. DEV.	3.58	3.40	15.58	4.23	1.35	-	0.00
	%REL. STD. DEV.	5.97	0.47	7.77	3.94	13.70	-	0.00
2	AVG.	3.97	48.80	51.30	120.36	19.52	<15.4	0.00
	STD. DEV.	0.17	0.08	1.89	2.11	1.13	-	0.00
	%REL. STD. DEV.	4.28	0.17	3.69	1.75	5.77	-	0.00
3	AVG.	<2.9	17.43	<6.1	53.11	14.10	<15.4	0.00
	STD. DEV.	-	0.38	-	0.40	0.10	-	0.00
	%REL. STD. DEV.	-	2.16	-	0.75	0.69	-	0.00
4	AVG.	<2.9	13.27	<6.1	21.89	8.56	<15.4	0.00
	STD. DEV.	-	0.47	-	1.07	0.15	-	0.00
	%REL. STD. DEV.	-	3.55	-	4.89	1.78	-	0.00
5	AVG.	<2.9	7.20	0.00	10.49	<5.2	0.00	0.00
	STD. DEV.	-	0.24	0.00	0.18	-	0.00	0.00
	%REL. STD. DEV.	-	3.40	0.00	1.70	-	0.00	0.00
6	AVG.	<2.9	7.30	0.00	7.66	<5.2	0.00	0.00
	STD. DEV.	-	0.28	0.00	0.28	-	0.00	0.00
	%REL. STD. DEV.	-	3.87	0.00	3.67	-	0.00	0.00
* 7	AVG.	<2.9	<5.8	<6.1	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	-	-	0.00	0.00
* 8-9	AVG.	<2.9	<5.8	<6.1	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	-	-	0.00	0.00
* 10-12	AVG.	<2.9	<5.8	<6.1	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	-	-	0.00	0.00

TABLE D-4.3. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2 AM DNT	4 AM DNT
Depth (inches; 2.54-cm sections)								
COLUMN #4 CONT'D				mg/kg				
* 13-15	AVG.	<2.9	<5.8	<6.1	<5.7	0.00	0.00	0.00
	STD DEV.	.	.	.	.	0.00	0.00	0.00
	%REL. STD. DEV.	.	.	.	.	0.00	0.00	0.00
* 16-18	AVG.	0.00	<5.8	<6.1	<5.7	0.00	0.00	0.00
	STD. DEV.	0.00	.	.	.	0.00	0.00	0.00
	%REL. STD. DEV.	0.00	.	.	.	0.00	0.00	0.00
COLUMN #7								
1	AVG.	35.80	645.83	68.70	76.27	15.37	<15.6	0.00
	STD. DEV.	7.72	0.61	1.65	1.56	1.30	.	0.00
	%REL. STD. DEV.	21.58	0.09	2.99	2.04	8.48	.	0.00
2	AVG.	17.43	254.80	63.51	141.71	35.68	<15.6	0.00
	STD. DEV.	1.75	2.04	2.88	4.16	1.17	.	0.00
	%REL. STD. DEV.	10.02	0.80	4.55	2.94	3.29	.	0.00
3	AVG.	3.13	27.83	24.27	93.53	30.90	<15.6	0.00
	STD. DEV.	0.45	0.82	2.35	2.77	1.38		0.00
	%REL. STD. DEV.	14.35	2.94	9.68	2.96	4.45		0.00
4	AVG.	<2.9	15.20	<6.1	18.17	9.71	<15.6	0.00
	STD. DEV.	.	0.08	.	0.17	0.36		0.00
	%REL. STD. DEV.	.	0.54	.	0.94	3.67		0.00
5	AVG.	<2.9	8.07	0.00	8.00	<5.7	0.00	0.00
	STD. DEV.	.	0.41	0.00	0.40		0.00	0.00
	%REL. STD. DEV.	.	5.09	0.00	5.07		0.00	0.00
6	AVG.	<2.9	<5.8	0.00	<5.7	<5.7	<15.6	0.00
	STD. DEV.	.	.	0.00				0.00
	%REL. STD. DEV.	.	.	0.00	.			0.00
* 7	AVG.	<2.9	<5.8	<6.1	<5.7	<5.7	0.00	0.00
	STD. DEV.	.	.		.		0.00	0.00
	%REL. STD. DEV.	.	.	.	.		0.00	0.00

TABLE D-4.3. Continued...

SAMPLE ID Depth (inches; 2.54-cm sections)		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
COLUMN #7 CONT'D					mg/kg			
# 8 9	AVG.	<2.9	<5.8	<6.1	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	SPEL. STD. DEV.	-	-	-	-	-	0.00	0.00
# 10 12	AVG.	<2.9	<5.8	<6.1	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	SPEL. STD. DEV.	-	-	-	-	-	0.00	0.00
# 13 15	AVG.	<2.9	<5.8	<6.1	<5.7	0.00	0.00	0.00
	STD. DEV.	-	-	-	-	0.00	0.00	0.00
	SPEL. STD. DEV.	-	-	-	-	0.00	0.00	0.00
# 16 18	AVG.	0.00	<5.8	<6.1	<5.7	0.00	0.00	0.00
	STD. DEV.	0.00	-	-	-	0.00	0.00	0.00
	SPEL. STD. DEV.	0.00	-	-	-	0.00	0.00	0.00

(COLUMNS #s 6 & 7 COMBINED FROM SECTION 7 DOWN)

TABLE D-4.4. Concentrations (mg/kg) of munition residues in soil sections (triplicate from AAD soil columns, after 19.5 weeks of leaching.

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #2		mg/kg						
1	AVG.	4.20	160.07	<6.1	13.35	6.93	<15.4	0.00
	STD. DEV.	0.37	1.54	-	0.41	4.71	-	0.00
	%REL. STD. DEV.	8.91	0.96	-	3.06	68.00	-	0.00
2	AVG.	16.93	423.03	19.23	86.30	25.99	<15.4	0.00
	STD. DEV.	1.87	6.76	2.44	2.83	0.49	-	0.00
	%REL. STD. DEV.	11.02	1.60	12.67	3.28	1.89	-	0.00
3	AVG.	5.63	124.23	10.55	90.13	26.48	<15.4	0.00
	STD. DEV.	1.11	1.31	2.49	1.23	0.53	-	0.00
	%REL. STD. DEV.	19.68	1.05	23.60	1.37	2.01	-	0.00
4	AVG.	<2.9	25.23	<6.1	61.24	19.63	<15.4	0.00
	STD. DEV.	-	0.39	-	1.40	0.38	-	0.00
	%REL. STD. DEV.	-	1.53	-	2.29	1.96	-	0.00
5	AVG.	<2.9	16.40	<6.1	31.45	12.52	<15.4	0.00
	STD. DEV.	-	0.45	-	1.42	0.73	-	0.00
	%REL. STD. DEV.	-	2.77	-	4.52	5.87	-	0.00
6	AVG.	<2.9	12.30	0.00	17.30	8.09	<15.4	0.00
	STD DEV.	-	0.41	0.00	1.27	0.14	-	0.00
	%REL. STD. DEV.	-	3.32	0.00	7.32	1.73	-	0.00
* 7	AVG.	<2.9	<5.8	0.00	6.54	<5.2	0.00	0.00
	STD. DEV.	-	-	0.00	0.41	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	6.33	-	0.00	0.00
* 8-9	AVG.	<2.9	<5.8	0.00	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00
* 10-12	AVG.	<2.9	<5.8	0.00	<5.7	0.00	0.00	0.00
	STD. DEV.	-	-	0.00	-	0.00	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	0.00	0.00	0.00

TABLE D-4.4. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #2 CONT'D					mg/kg			
* 13-15	AVG.	<2.9	6.23	0.00	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	0.14	0.00	-	-	0.00	0.00
	%REL. STD. DEV.		2.25	0.00	-	-	0.00	0.00
COLUMN #11								
1	AVG.	85.23	750.00	113.35	47.07	7.30	0.00	0.00
	STD. DEV.	0.25	4.67	17.35	5.57	1.45	0.00	0.00
	%REL. STD. DEV.	0.29	0.62	15.31	11.83	19.82	0.00	0.00
2	AVG.	86.67	826.10	263.37	166.91	15.58	<15.4	<14.6
	STD. DEV.	1.19	2.55	29.47	18.22	2.43	-	-
	%REL. STD. DEV.	1.37	0.31	11.19	10.92	15.61	-	-
3	AVG.	11.33	118.87	112.82	205.47	52.39	<15.4	0.00
	STD. DEV.	0.12	0.29	1.24	2.25	0.94	-	0.00
	%REL. STD. DEV.	1.10	0.24	1.10	1.10	1.79	-	0.00
4	AVG.	<2.9	20.67	22.66	90.16	35.86	<15.4	0.00
	STD. DEV.	-	1.00	3.80	2.27	1.32	-	0.00
	%REL. STD. DEV.	-	4.83	16.75	2.52	3.68	-	0.00
5	AVG.	<2.9	14.83	<6.1	18.52	10.15	0.00	0.00
	STD. DEV.	-	0.63	-	0.52	0.40	0.00	0.00
	%REL. STD. DEV.	-	4.28	-	2.83	3.91	0.00	0.00
6	AVG.	<2.9	<5.8	0.00	5.70	<5.2	<15.4	0.00
	STD. DEV.	-	-	0.00	6.62	-	-	0.00
	%REL. STD. DEV.	-	-	0.00	116.35	-	-	0.00
* 7	AVG.	<2.9	<5.8	0.00	6.54	<5.2	0.00	0.00
	STD. DEV.	-	-	0.00	0.41	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	6.33	-	0.00	0.00

TABLE D-4.4. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #11 CONT'D					mg/kg			
* 8-9	AVG.	<2.9	<5.8	0.00	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00
* 10-12	AVG.	<2.9	<5.8	0.00	<5.7	0.00	0.00	0.00
	STD. DEV.	-	-	0.00	-	0.00	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	0.00	0.00	0.00
* 13-15	AVG.	<2.9	6.23	0.00	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	0.14	0.00	-	-	0.00	0.00
	%REL. STD. DEV.		2.25	0.00	-	-	0.00	0.00

* (COLUMNS #s 2 & 11 COMBINED FROM SECTION 7 DOWN)

TABLE D-4.5. Concentrations (mg/kg) of munition residues in soil sections (triplicate from AAD soil columns, after 26 weeks of leaching.

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM DNT
Depth (inches; 2.54-cm sections)								
COLUMN #6					mg/kg			
1	AVG.	26.60	156.00	<6.1	7.08	<5.2	<15.4	0.00
	STD. DEV.	1.35	0.57	-	0.48	-	-	0.00
	%REL. STD. DEV.	5.07	0.36	-	6.77	-	-	0.00
2	AVG.	18.53	186.10	12.61	67.33	16.38	<15.4	0.00
	STD. DEV.	0.33	2.12	1.51	2.58	1.05	-	0.00
	%REL. STD. DEV.	1.78	1.14	11.94	3.83	6.39	-	0.00
3	AVG.	<2.9	24.70	10.04	73.33	17.76	<15.4	0.00
	STD. DEV.	-	0.73	0.48	2.93	0.98	-	0.00
	%REL. STD. DEV.	-	2.94	4.77	3.99	5.54	-	0.00
4	AVG.	<2.9	16.57	<6.1	66.06	17.67	<15.4	0.00
	STD. DEV.	-	0.26	-	2.96	1.12	-	0.00
	%REL. STD. DEV.	-	1.58	-	4.47	6.32	-	0.00
5	AVG.	<2.9	12.13	0.00	46.76	15.43	<15.4	0.00
	STD. DEV.	-	0.58	0.00	1.61	0.53	-	0.00
	%REL. STD. DEV.	-	4.77	0.00	3.45	3.46	-	0.00
6	AVG.	<2.9	11.43	0.00	32.62	13.79	<15.4	0.00
	STD. DEV.	-	0.33	0.00	0.32	0.68	-	0.00
	%REL. STD. DEV.	-	2.89	0.00	0.98	4.91	-	0.00
* 7	AVG.	<2.9	<5.8	0.00	18.30	6.59	0.00	0.00
	STD. DEV.	-	-	0.00	0.52	2.35	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	2.84	35.66	0.00	0.00
* 8-9	AVG.	<2.9	<5.8	0.00	9.59	5.99	0.00	0.00
	STD. DEV.	-	-	0.00	0.53	0.40	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	5.53	6.68	0.00	0.00
* 10-12	AVG.	<2.9	<5.8	<6.1	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	-	-	0.00	0.00

TABLE D-4.5. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #6 CONT'D		mg/kg						
* 13-15	AVG.	<2.9	7.79	0.00	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	0.21	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	2.70	0.00	-	-	0.00	0.00
COLUMN #10								
1	AVG.	17.13	432.97	14.15	25.55	8.55	<15.4	0.00
	STD. DEV.	2.40	1.54	0.22	0.79	0.39	-	0.00
	%REL. STD. DEV.	14.01	0.36	1.58	3.07	4.51	-	0.00
2	AVG.	4.03	63.60	24.74	83.48	18.93	<15.4	0.00
	STD. DEV.	0.57	2.14	3.26	0.21	0.51	-	0.00
	%REL. STD. DEV.	14.22	3.36	13.18	0.25	2.69	-	0.00
3	AVG.	<2.9	22.40	6.69	73.46	18.03	<15.4	0.00
	STD. DEV.	-	0.83	0.49	0.86	0.17	-	0.00
	%REL. STD. DEV.	-	3.70	7.29	1.17	0.94	-	0.00
4	AVG.	<2.9	19.33	<6.1	64.74	17.87	<15.4	0.00
	STD. DEV.	-	0.40	-	0.94	0.25	-	0.00
	%REL. STD. DEV.	-	2.08	-	1.44	1.42	-	0.00
5	AVG.	<2.9	14.97	<6.1	51.03	16.15	<15.4	0.00
	STD. DEV.	-	0.40	-	2.07	0.72	-	0.00
	%REL. STD. DEV.	-	2.69	-	4.06	4.45	-	0.00
6	AVG.	<2.9	11.60	0.00	37.07	13.11	<15.4	0.00
	STD. DEV.	-	0.62	0.00	0.19	0.47	-	0.00
	%REL. STD. DEV.	-	5.31	0.00	0.51	3.58	-	0.00
* 7	AVG.	<2.9	<5.8	0.00	18.30	6.59	0.00	0.00
	STD. DEV.	-	-	0.00	0.52	2.35	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	2.84	35.66	0.00	0.00

TABLE D-4.5. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #10 CONT'D					mg/kg			
* 8-9	AVG.	<2.9	<5.8	0.00	9.59	5.99	0.00	0.00
	STD. DEV.	-	-	0.00	0.53	0.40	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	5.53	6.68	0.00	0.00
* 10-12	AVG.	<2.9	<5.8	<6.1	<5.7	<5.7	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	-	-	0.00	0.00
* 13-15	AVG.	<2.9	7.79	0.00	<5.7	<5.7	0.00	0.00
	STD. DEV.	-	0.21	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	2.70	0.00	-	-	0.00	0.00

* (COLUMNS #s 6 & 10 COMBINED FROM SECTION 7 DOWN)

TABLE D-4.6. Concentrations (mg/kg) of munition residues in soil sections (triplicate from AAD soil columns, after 32.5 weeks of leaching.

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #1		-------------------------			mg/kg	-------------------------		
1	AVG.	17.90	280.43	6.96	6.85	<5.2	0.00	0.00
	STD. DEV.	1.20	5.20	2.28	1.30	-	0.00	0.00
	%REL. STD. DEV.	6.72	1.85	32.72	18.95	-	0.00	0.00
2	AVG.	2.97	72.17	21.49	65.33	15.09	<15.4	0.00
	STD. DEV.	0.19	1.08	0.63	3.68	0.77	-	0.00
	%REL. STD. DEV.	6.36	1.49	2.91	5.63	5.11	-	0.00
3	AVG.	<2.9	15.53	<6.1	48.58	13.57	<15.4	0.00
	STD. DEV.	-	0.26	-	2.54	0.82	-	0.00
	%REL. STD. DEV.	-	1.69	-	5.24	6.05	-	0.00
4	AVG.	<2.9	10.60	<6.1	34.27	11.12	<15.4	0.00
	STD. DEV.	-	0.22	-	0.86	0.61	-	0.00
	%REL. STD. DEV.	-	2.04	-	2.50	5.49	-	0.00
5	AVG.	<2.9	7.53	0.00	23.96	7.32	<15.4	0.00
	STD. DEV.	-	0.09	0.00	1.05	0.60	-	0.00
	%REL. STD. DEV.	-	1.25	0.00	4.40	8.14	-	0.00
6	AVG.	<2.9	6.03	0.00	15.45	6.23	<15.4	0.00
	STD. DEV.	-	0.42	0.00	0.76	0.03	-	0.00
	%REL. STD. DEV.	-	6.94	0.00	4.90	0.48	-	0.00
* 7	AVG.	<2.9	<5.8	0.00	10.29	<5.2	0.00	0.00
	STD. DEV.	-	-	0.00	0.73	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	7.09	-	0.00	0.00
* 8-9	AVG.	<2.9	<5.8	0.00	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00
* 10-12	AVG.	<2.9	<5.8	0.00	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00

TABLE D-4.6. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #1 CONT'D		------------------------			mg/kg	------------------------		
* 13-15	AVG.	<2.9	<5.8	0.00	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00
COLUMN #9								
1	AVG.	22.90	439.77	11.33	13.65	<5.2	<15.4	0.00
	STD. DEV.	2.59	1.11	0.34	0.81	-	-	0.00
	%REL. STD. DEV.	11.32	0.25	2.96	5.93	-	-	0.00
2	AVG.	22.87	363.57	25.30	91.93	22.28	<15.4	0.00
	STD. DEV.	2.82	1.60	4.30	17.47	4.43	-	0.00
	%REL. STD. DEV.	12.32	0.44	16.98	19.00	19.87	-	0.00
3	AVG.	<2.9	31.73	31.17	120.33	29.04	<15.4	0.00
	STD. DEV.	-	1.38	3.74	10.78	2.82	-	0.00
	%REL. STD. DEV.	-	4.35	12.01	8.96	9.70	-	0.00
4	AVG.	<2.9	15.10	7.72	64.94	20.94	<15.4	0.00
	STD. DEV.	-	0.59	0.47	2.71	0.56	-	0.00
	%REL. STD. DEV.	-	3.90	6.11	4.17	2.70	-	0.00
5	AVG.	<2.9	11.97	<6.1	41.67	17.51	<15.4	0.00
	STD. DEV.	-	0.97	-	1.35	0.64	-	0.00
	%REL. STD. DEV.	-	8.08	-	3.23	3.66	-	0.00
6	AVG.	<2.9	10.10	0.00	18.09	9.93	<15.4	0.00
	STD. DEV.	-	0.49	0.00	0.98	0.57	-	0.00
	%REL. STD. DEV.	-	4.85	0.00	5.44	5.78	-	0.00
* 7	AVG.	<2.9	<5.8	0.00	10.29	<5.2	0.00	0.00
	STD. DEV.	-	-	0.00	0.73	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	7.09	-	0.00	0.00

TABLE D-4.6. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #9 CONT'D					mg/kg			
* 8-9	AVG.	<2.9	<5.8	0.00	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00
* 10-12	AVG.	<2.9	<5.8	0.00	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00
* 13-15	AVG.	<2.9	<5.8	0.00	<5.7	<5.2	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00

* (COLUMNS #s 1 & 9 COMBINED FROM SECTION 7 DOWN)

TABLE D-4.7. Amounts (ug) of munition residues in each soil-core section (triplicates) from AAD soil columns, after 0 weeks of leaching (time zero).

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
	COLUMN #s 1,2,4,5,6,7,9,10,11,12 (Treatment columns)							
		ug						
1	AVG.	33460.00	427728.00	152544.00	358543.50	78750.00	0.00	0.00
	STD. DEV.	3846.50	49588.00	17846.50	41916.00	10349.50	0.00	0.00
	%REL. STD. DEV.	11.50	11.59	11.70	11.69	13.14	0.00	0.00
	Below this depth: no detectable concentrations of munition residues.							
	COLUMN #s 3 and 8 (Control columns)							
1	AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	At all depths: no detectable concentrations of munition residues.							

TABLE D-4.8. Amounts (ug) of munition residues in each soil-core section (triplicates) from AAD soil columns, after 6.5 weeks of leaching.

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #5		ug						
1	AVG.	27255.06	354436.57	109118.16	35444.26	5536.15	0.00	0.00
	STD. DEV.	1352.23	410.71	4407.98	2005.67	817.53	0.00	0.00
	%REL. STD. DEV.	4.96	0.12	4.04	5.66	14.77	0.00	0.00
2	AVG.	935.13	8605.24	13930.20	21865.24	5436.04	*	0.00
	STD. DEV.	54.56	601.90	733.22	501.41	121.96	-	0.00
	%REL. STD. DEV.	5.83	6.99	5.26	2.29	2.24	-	0.00
3	AVG.	*	3973.39	1777.62	13319.85	4381.27	*	0.00
	STD. DEV.	-	8.35	433.14	279.06	81.95	-	0.00
	%REL. STD. DEV.	-	0.21	24.37	2.10	1.87	-	0.00
4	AVG.	*	4766.70	2838.10	8482.54	2340.25	*	0.00
	STD. DEV.	-	68.12	82.51	131.30	11.94	-	0.00
	%REL. STD. DEV.	-	1.43	2.91	1.55	0.51	-	0.00
5	AVG.	*	3653.38	2140.61	4850.85	1656.58	0.00	0.00
	STD. DEV.	-	21.01	290.60	100.15	17.23	0.00	0.00
	%REL. STD. DEV.	-	0.57	13.58	2.06	1.04	0.00	0.00
6	AVG.	*	2787.49	*	3446.97	*	0.00	0.00
	STD. DEV.	-	423.06	-	1367.34	-	0.00	0.00
	%REL. STD. DEV.	-	15.18	-	39.67	-	0.00	0.00
** 7	AVG.	*	*	*	5163.14	*	0.00	0.00
	STD. DEV.	-	-	-	161.32	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	3.12	-	0.00	0.00
** 8-9	AVG.	*	*	*	*	*	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	-	-	0.00	0.00
**10-12	AVG.	*	*	0.00	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00

TABLE D-4.8. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #5 CONT'D		ug						
**13-15	AVG.	0.00	*	*	5168.22	*	0.00	0.00
	STD. DEV.	0.00	-	-	56.18	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	-	1.68	-	0.00	0.00
COLUMN #12								
1	AVG.	18660.09	349700.00	96121.93	45232.77	8361.85	0.00	0.00
	STD. DEV.	1002.93	2377.67	4677.11	2388.08	380.38	0.00	0.00
	%REL. STD. DEV.	5.37	0.68	4.87	5.28	4.55	0.00	0.00
2	AVG.	1938.29	30257.67	30346.59	41417.75	9704.86	*	0.00
	STD. DEV.	86.51	324.07	321.96	171.10	644.59	-	0.00
	%REL. STD. DEV.	4.46	1.07	1.06	0.41	6.64	-	0.00
3	AVG.	*	8646.14	11007.71	30385.29	7755.49	*	0.00
	STD. DEV.	-	50.07	307.38	660.48	152.25	-	0.00
	%REL. STD. DEV.	-	0.58	2.79	2.17	1.96	-	0.00
4	AVG.	*	5106.96	3455.79	14521.29	4254.99	*	0.00
	STD. DEV.	-	54.62	45.94	479.31	165.31	-	0.00
	%REL. STD. DEV.	-	1.07	1.33	3.30	3.89	-	0.00
5	AVG.	*	3677.98	*	4880.24	2140.81	*	0.00
	STD. DEV.	-	29.53	-	194.31	212.23	-	0.00
	%REL. STD. DEV.	-	0.80	-	3.98	9.91	-	0.00
6	AVG.	*	2837.67	*	2290.04	*	*	0.00
	STD. DEV.	-	117.98	-	169.96	-	-	0.00
	%REL. STD. DEV.	-	4.16	-	7.42	-	-	0.00
** 7	AVG.	*	*	*	5163.14	*	0.00	0.00
	STD. DEV.	-	-	-	161.32	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	3.12	-	0.00	0.00

TABLE D-4.8, Continued...

SAMPLE ID		HMX	RDX	TNT	2,4 DNT	2,6 DNT	2 AM DNT	4 AM DNT
Depth (Inches; 2.54-cm sections)								
COLUMN #12 CONT'D								
** 8-9	AVG.	*	*	*	*	*	[illegible]	[illegible]
	STD. DEV.	*	*	*	*	*	[illegible]	[illegible]
	%REL. STD. DEV.	*	*	*	*	*	[illegible]	[illegible]
**10-12	AVG.	*	*	0.00	*	*	[illegible]	[illegible]
	STD. DEV.	*	*	0.00	*	*	[illegible]	[illegible]
	%REL. STD. DEV.	*	*	0.00	*	*	[illegible]	[illegible]
**13-15	AVG.	0.00	*	*	[illegible]148.77	*	[illegible]	[illegible]
	STD. DEV.	0.00	*	*	56.18	*	[illegible]	[illegible]
	%REL. STD. DEV.	0.00	*	*	1.68	*	[illegible]	[illegible]

* No quantifiable concentrations of munition residues

** COLUMNS ... 5 AND 12 COMBINED FROM SECTION [illegible]

TABLE D-4.9. Amounts (ug) of munition residues in each soil-core section (triplicates) from AAD soil columns, after 13 weeks of leaching.

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #4		ug						
1	AVG.	20465.40	247699.00	68408.91	36580.35	3354.60	*	0.00
	STD. DEV.	1221.59	1159.04	5312.66	1441.88	459.48	-	0.00
	REL. STD. DEV.	5.97	0.47	7.77	3.94	13.70	-	0.00
2	AVG.	920.74	11327.46	11907.04	27938.89	4530.20	*	0.00
	STD. DEV.	39.45	18.95	439.74	489.17	261.32	-	0.00
	REL. STD. DEV.	4.28	0.17	3.69	1.75	5.77	-	0.00
3	AVG.	*	4821.19	*	14688.89	3898.73	*	0.00
	STD. DEV.	-	104.29	-	110.17	26.86	-	0.00
	REL. STD. DEV.	-	2.16	-	0.75	0.69	-	0.00
4	AVG.	*	3878.78	*	6401.15	2503.91	*	0.00
	STD. DEV.	-	137.82	-	313.19	44.58	-	0.00
	REL. STD. DEV.	-	3.55	-	4.89	1.78	-	0.00
5	AVG.	*	2426.18	0.00	3533.40	*	0.00	0.00
	STD. DEV.	-	82.54	0.00	60.15	-	0.00	0.00
	REL. STD. DEV.	-	3.40	0.00	1.70	-	0.00	0.00
6	AVG.	*	1794.05	0.00	1881.78	*	0.00	0.00
	STD. DEV.	-	69.51	0.00	69.07	-	0.00	0.00
	REL. STD. DEV.	-	3.87	0.00	3.67	-	0.00	0.00
** 7	AVG.	*	*	*	*	*	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	REL. STD. DEV.	-	-	-	-	-	0.00	0.00
** 8 9	AVG.	*	*	*	*	*	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	REL. STD. DEV.	-	-	-	-	-	0.00	0.00
**10 12	AVG.	*	*	*	*	*	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	REL. STD. DEV.	-	-	-	-	-	0.00	0.00

TABLE D-4.9. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #4 CONT'D					ug			
**13-15	AVG.	*	*	*	*	0.00	0.00	0.00
	STD. DEV.	-	-	-	-	0.00	0.00	0.00
	%REL. STD. DEV.	-	-	-	-	0.00	0.00	0.00
**16-18	AVG.	0.00	*	*	*	0.00	0.00	0.00
	STD. DEV.	0.00	-	-	-	0.00	0.00	0.00
	%REL. STD. DEV.	0.00	-	-	-	0.00	0.00	0.00
COLUMN #7								
1	AVG.	14081.74	232396.67	17524.58	27444.01	5532.16	*	0.00
	STD. DEV.	1493.04	220.52	523.21	560.74	469.36	-	0.00
	%REL. STD. DEV.	10.60	0.09	2.99	2.04	8.48	-	0.00
2	AVG.	3073.50	44921.24	11161.60	24983.04	6272.69	*	0.00
	STD. DEV.	307.84	359.87	507.43	733.38	206.43	-	0.00
	%REL. STD. DEV.	10.02	0.80	4.55	2.94	3.29	-	0.00
3	AVG.	528.85	4697.71	4095.81	15785.49	5224.84	*	0.00
	STD. DEV.	75.90	138.04	396.34	466.79	232.43	-	0.00
	%REL. STD. DEV.	14.35	2.94	9.68	2.96	4.45	-	0.00
4	AVG.	*	2935.73	*	3499.60	1876.06	*	0.00
	STD. DEV.	-	15.77	-	33.05	65.13	-	0.00
	%REL. STD. DEV.	-	0.54	-	0.94	3.47	-	0.00
5	AVG.	*	2507.12	0.00	2485.18	*	0.00	0.00
	STD. DEV.	-	127.73	0.00	124.65	-	0.00	0.00
	%REL. STD. DEV.	-	5.09	0.00	5.02	-	0.00	0.00
6	AVG.	*	*	0.00	*	*	*	0.00
	STD. DEV.	-	-	0.00	-	-	-	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	-	0.00
** 7	AVG.	*	*	*	*	*	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	-	-	0.00	0.00

TABLE D-4.9. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #7 CONT'D		ug						
** 8-9	AVG.	*	*	*	*	*	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	-	-	0.00	0.00
**10-12	AVG.	*	*	*	*	*	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	-	-	0.00	0.00
**13-15	AVG.	*	*	*	*	0.00	0.00	0.00
	STD. DEV.	-	-	-	-	0.00	0.00	0.00
	%REL. STD. DEV.	-	-	-	-	0.00	0.00	0.00
**16-18	AVG.	0.00	*	*	*	0.00	0.00	0.00
	STD. DEV.	0.00	-	-	-	0.00	0.00	0.00
	%REL. STD. DEV.	0.00	-	-	-	0.00	0.00	0.00

* No quantifiable concentrations of munition residues.

** (COLUMNS #s 4 AND 7 COMBINED FROM SECTION 7 DOWN)

TABLE D-4.10. **Amounts (ug) of munition residues in each soil-core section (triplicates from AAD soil columns, after 19.5 weeks of leaching.**

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #2					ug			
1	AVG.	1172.05	44668.20	1659.59	3726.13	1933.52	*	0.00
	STD. DEV.	104.42	430.11	351.89	114.02	1314.89	-	0.00
	%REL. STD. DEV.	8.91	0.96	21.20	3.06	68.00	-	0.00
2	AVG.	1596.31	39879.35	1812.49	8135.10	2449.61	*	0.00
	STD. DEV.	175.92	637.16	229.65	267.08	46.21	-	0.00
	%REL. STD. DEV.	11.02	1.60	12.67	3.28	1.89	-	0.00
3	AVG.	1439.32	31741.62	2695.22	23027.10	6765.84	*	0.00
	STD. DEV.	283.24	334.00	636.20	314.34	135.87	-	0.00
	%REL. STD. DEV.	19.68	1.05	23.60	1.37	2.01	-	0.00
4	AVG.	*	6358.80	*	15433.52	4946.76	*	0.00
	STD. DEV.	-	97.24	-	352.84	96.80	-	0.00
	%REL. STD. DEV.	-	1.53	-	2.29	1.96	-	0.00
5	AVG.	*	5835.28	*	11190.84	4453.16	*	0.00
	STD. DEV.	-	161.75	-	505.57	261.28	-	0.00
	%REL. STD. DEV.	-	2.77	-	4.52	5.87	-	0.00
6	AVG.	*	3602.42	0.00	5066.02	2369.64	*	0.00
	STD. DEV.	-	119.57	0.00	371.06	40.89	-	0.00
	%REL. STD. DEV.	-	3.32	0.00	7.32	1.73	-	0.00
** 7	AVG.	*	*	0.00	4206.92	*	0.00	0.00
	STD. DEV.	-	-	0.00	266.31	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	6.33	-	0.00	0.00
** 8-9	AVG.	*	*	0.00	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00
**10-12	AVG.	*	*	0.00	*	0.00	0.00	0.00
	STD. DEV.	-	-	0.00	-	0.00	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	0.00	0.00	0.00

TABLE D-4.10. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #2 CONT'D				ug				
**13-15	AVG.	*	6352.65	0.00	*	*	0.00	0.00
	STD. DEV.	-	139.26	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	2.19	0.00	-	-	0.00	0.00
COLUMN #11								
1	AVG.	23665.89	208245.00	31473.96	13068.67	2026.27	0.00	0.00
	STD. DEV.	69.26	1295.81	4817.91	1545.85	401.63	0.00	0.00
	%REL. STD. DEV.	0.29	0.62	15.31	11.83	19.82	0.00	0.00
2	AVG.	12319.67	117430.12	37438.59	23725.64	2214.14	*	*
	STD. DEV.	169.12	362.04	4189.21	2590.46	345.63	-	-
	%REL. STD. DEV.	1.37	0.31	11.19	10.92	15.61	-	-
3	AVG.	2343.39	24578.06	23328.50	42485.74	10833.26	*	0.00
	STD. DEV.	25.79	59.29	256.06	465.64	194.20	-	0.00
	%REL. STD. DEV.	1.10	0.24	1.10	1.10	1.79	-	0.00
4	AVG.	*	5900.33	6469.17	25739.89	10237.76	*	0.00
	STD. DEV.	-	284.86	1083.73	648.61	377.13	-	0.00
	%REL. STD. DEV.	-	4.83	16.75	2.52	3.68	-	0.00
5	AVG.	*	4208.96	*	5253.66	2879.41	0.00	0.00
	STD. DEV.	-	179.96	-	148.65	112.62	0.00	0.00
	%REL. STD. DEV.	-	4.28	-	2.83	3.91	0.00	0.00
6	AVG.	*	*	0.00	1671.24	*	*	0.00
	STD. DEV.	-	-	0.00	1944.56	-	-	0.00
	%REL. STD. DEV.	-	-	0.00	116.35	-	-	0.00
** 7	AVG.	*	*	0.00	4206.92	*	0.00	0.00
	STD. DEV.	-	-	0.00	266.31	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	6.33	-	0.00	0.00

TABLE D-4.10. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #11 CONT'D					ug			
** 8-9	AVG.	*	*	0.00	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00
**10-12	AVG.	*	*	0.00	*	0.00	0.00	0.00
	STD. DEV.	-	-	0.00	-	0.00	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	0.00	0.00	0.00
**13-15	AVG.	*	6352.65	0.00	*	*	0.00	0.00
	STD. DEV.	-	139.26	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	2.19	0.00	-	-	0.00	0.00

* No quantifiable concentrations of munition residues.

** (COLUMNS #s 2 AND 11 COMBINED FROM SECTION 7 DOWN)

TABLE D-4.11. **Amounts (ug) of munition residues in each soil-core section (triplicates from AAD soil columns, after 26 weeks of leaching.**

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #6		------------------------			ug	------------------------		
1	AVG.	8454.61	49579.92	*	2250.06	*	*	0.00
	STD. DEV.	428.76	179.79	-	152.28	-	-	0.00
	%REL. STD. DEV.	5.07	0.36	-	6.77	-	-	0.00
2	AVG.	2607.08	26178.69	1774.27	9471.56	2303.76	*	0.00
	STD. DEV.	46.42	297.96	211.78	363.03	147.16		0.00
	%REL. STD. DEV.	1.78	1.14	11.94	3.83	6.39	-	0.00
3	AVG.	*	6259.23	2544.66	18583.59	4501.08	*	0.00
	STD. DEV.	-	183.90	121.51	741.67	249.25	-	0.00
	%REL. STD. DEV.	-	2.94	4.77	3.99	5.54	-	0.00
4	AVG.	*	5387.98	*	21486.31	5746.17	*	0.00
	STD. DEV.	-	85.36	-	961.36	363.28	-	0.00
	%REL. STD. DEV.	-	1.58	-	4.47	6.32	-	0.00
5	AVG.	*	4807.95	0.00	18527.68	6114.38	*	0.00
	STD. DEV.	-	229.54	0.00	639.27	211.79	-	0.00
	%REL. STD. DEV.	-	4.77	0.00	3.45	3.46	-	0.00
6	AVG.	*	2254.20	0.00	6432.11	2719.17	*	0.00
	STD. DEV.	-	65.06	0.00	62.74	133.61	-	0.00
	%REL. STD. DEV.	-	2.89	0.00	0.98	4.91	-	0.00
** 7	AVG.	*	*	0.00	13541.86	4876.62	0.00	0.00
	STD. DEV.	-	-	0.00	382.48	1741.12	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	2.82	35.70	0.00	0.00
** 8-9	AVG.	*	*	0.00	12441.90	7772.61	0.00	0.00
	STD. DEV.	-	-	0.00	687.69	525.67	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	5.53	6.76	0.00	0.00
**10-12	AVG.	*	*	*	*	*	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	-	-	0.00	0.00

TABLE D-4.11. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #6 CONT'D		ug						
**13-15	AVG.	*	15052.37	0.00	*	*	0.00	0.00
	STD. DEV.	-	403.76	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	2.68	0.00	-	-	0.00	0.00
COLUMN #10								
1	AVG.	5835.61	147468.45	4819.05	8703.45	2913.58	*	0.00
	STD. DEV.	817.60	524.96	76.18	267.47	131.41	-	0.00
	%REL. STD. DEV.	14.01	0.36	1.58	3.07	4.51	-	0.00
2	AVG.	795.37	12541.92	4879.21	16461.62	3733.67	*	0.00
	STD. DEV.	113.09	421.10	643.22	41.88	100.42	-	0.00
	%REL. STD. DEV.	14.22	3.36	13.18	0.25	2.69	-	0.00
3	AVG.	*	4472.38	1336.46	14668.01	3599.59	*	0.00
	STD. DEV.	-	165.45	97.47	172.08	33.69	-	0.00
	%REL. STD. DEV.	-	3.70	7.29	1.17	0.94	-	0.00
4	AVG.	*	3674.49	*	12304.03	3395.68	*	0.00
	STD. DEV.	-	76.55	-	177.75	48.07	-	0.00
	%REL. STD. DEV.	-	2.08	-	1.44	1.42	-	0.00
5	AVG.	*	4247.09	*	14479.49	4582.20	*	0.00
	STD. DEV.	-	114.29	-	587.89	204.11	-	0.00
	%REL. STD. DEV.	-	2.69	-	4.06	4.45	-	0.00
6	AVG.	*	3018.09	0.00	9644.84	3412.23	*	0.00
	STD. DEV.	-	160.39	0.00	48.84	122.10	-	0.00
	%REL. STD. DEV.	-	5.31	0.00	0.51	3.58	-	0.00
** 7	AVG.	*	*	0.00	13541.86	4876.62	0.00	0.00
	STD. DEV.	-	-	0.00	382.48	1741.12	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	2.82	35.70	0.00	0.00

TABLE D-4.11. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #10 CONT'D					ug			
** 8-9	AVG.	*	*	0.00	12441.90	7772.61	0.00	0.00
	STD. DEV.	-	-	0.00	687.69	525.67	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	5.53	6.76	0.00	0.00
**10-12	AVG.	*	*	*	*	*	0.00	0.00
	STD. DEV.	-	-	-	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	-	-	-	0.00	0.00
**13-15	AVG.	*	15052.37	0.00	*	*	0.00	0.00
	STD. DEV.	-	403.76	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	2.68	0.00	-	-	0.00	0.00

* No quantifiable concentrations of munition residues.

** (COLUMNS #s 6 AND 10 COMBINED FROM SECTION 7 DOWN)

TABLE D-4.12. Amounts (ug) of munition residues in each soil-core section (triplicates from AAD soil columns, after 32.5 weeks of leaching.

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #1					ug			
1	AVG.	5662.31	88709.48	2200.47	2166.03	*	0.00	0.00
	STD. DEV.	380.47	1644.17	720.07	410.55	-	0.00	0.00
	%REL. STD. DEV.	6.72	1.85	32.72	18.95	-	0.00	0.00
2	AVG.	467.66	11376.35	3387.98	10298.95	2378.18	*	0.00
	STD. DEV.	29.72	169.95	98.56	579.40	121.45	-	0.00
	%REL. STD. DEV.	6.36	1.49	2.91	5.63	5.11	-	0.00
3	AVG.	*	3868.27	*	12096.91	3380.53	*	0.00
	STD. DEV.	-	65.36	-	633.52	204.58	-	0.00
	%REL. STD. DEV.	-	1.69	-	5.24	6.05	-	0.00
4	AVG.	*	2813.56	*	9096.96	2950.32	*	0.00
	STD. DEV.	-	57.34	-	227.17	161.83	-	0.00
	%REL. STD. DEV.	-	2.04	-	2.50	5.49	-	0.00
5	AVG.	*	2325.34	0.00	7395.19	2259.22	*	0.00
	STD. DEV.	-	29.10	0.00	325.27	183.97	-	0.00
	%REL. STD. DEV.	-	1.25	0.00	4.40	8.14	-	0.00
6	AVG.	*	2114.56	0.00	5416.13	2184.48	*	0.00
	STD. DEV.	-	146.85	0.00	265.50	10.40	-	0.00
	%REL. STD. DEV.	-	6.94	0.00	4.90	0.48	-	0.00
** 7	AVG.	*	*	0.00	6323.18	*	0.00	0.00
	STD. DEV.	-	-	0.00	448.61	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	7.09	-	0.00	0.00
** 8-9	AVG.	*	*	0.00	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00
**10-12	AVG.	*	*	0.00	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00

TABLE D-4.12. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #1 CONT'D		ug						
**13-15	AVG.	*	*	0.00	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00
COLUMN #9								
1	AVG.	6358.42	122105.61	3145.89	3789.89	*	*	0.00
	STD. DEV.	719.78	309.47	93.07	224.67	-	-	0.00
	%REL. STD. DEV.	11.32	0.25	2.96	5.93	-	-	0.00
2	AVG.	3250.50	51681.00	3596.92	13067.74	3167.35	*	0.00
	STD. DEV.	400.00	226.95	610.93	2482.75	629.30	-	0.00
	%REL. STD. DEV.	12.32	0.44	16.98	19.00	19.87	-	0.00
3	AVG.	*	6561.50	6445.80	24879.67	6003.67	*	0.00
	STD. DEV.	-	285.68	774.03	2229.58	582.17	-	0.00
	%REL. STD. DEV.	-	4.35	12.01	8.96	9.70	-	0.00
4	AVG.	*	4311.05	2205.22	18539.15	5978.47	*	0.00
	STD. DEV.	-	168.10	134.73	773.43	161.22	-	0.00
	%REL. STD. DEV.	-	3.90	6.11	4.17	2.70	-	0.00
5	AVG.	*	3395.54	*	11824.95	4967.54	*	0.00
	STD. DEV.	-	274.45	-	381.93	181.78	-	0.00
	%REL. STD. DEV.	-	8.08	-	3.23	3.66	-	0.00
6	AVG.	*	2968.19	0.00	5316.24	2918.82	*	0.00
	STD. DEV.	-	143.97	0.00	289.33	168.84	-	0.00
	%REL. STD. DEV.	-	4.85	0.00	5.44	5.78	-	0.00
** 7	AVG.	*	*	0.00	6323.18	*	0.00	0.00
	STD. DEV.	-	-	0.00	448.61	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	7.09	-	0.00	0.00

TABLE D-4.12. Continued...

SAMPLE ID		HMX	RDX	TNT	2,4-DNT	2,6-DNT	2-AM-DNT	4-AM-DNT
Depth (inches; 2.54-cm sections)								
COLUMN #9 CONT'D		-------------------------		ug	-----------------------------			
** 8-9	AVG.	*	*	0.00	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00
**10-12	AVG.	*	*	0.00	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00
**13-15	AVG.	*	*	0.00	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	-	-	0.00	0.00

* No quantifiable concentrations of munition residues.

** (COLUMNS #s 1 AND 9 COMBINED FROM SECTION 7 DOWN)

END

FILMED

DATE: 5-94

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